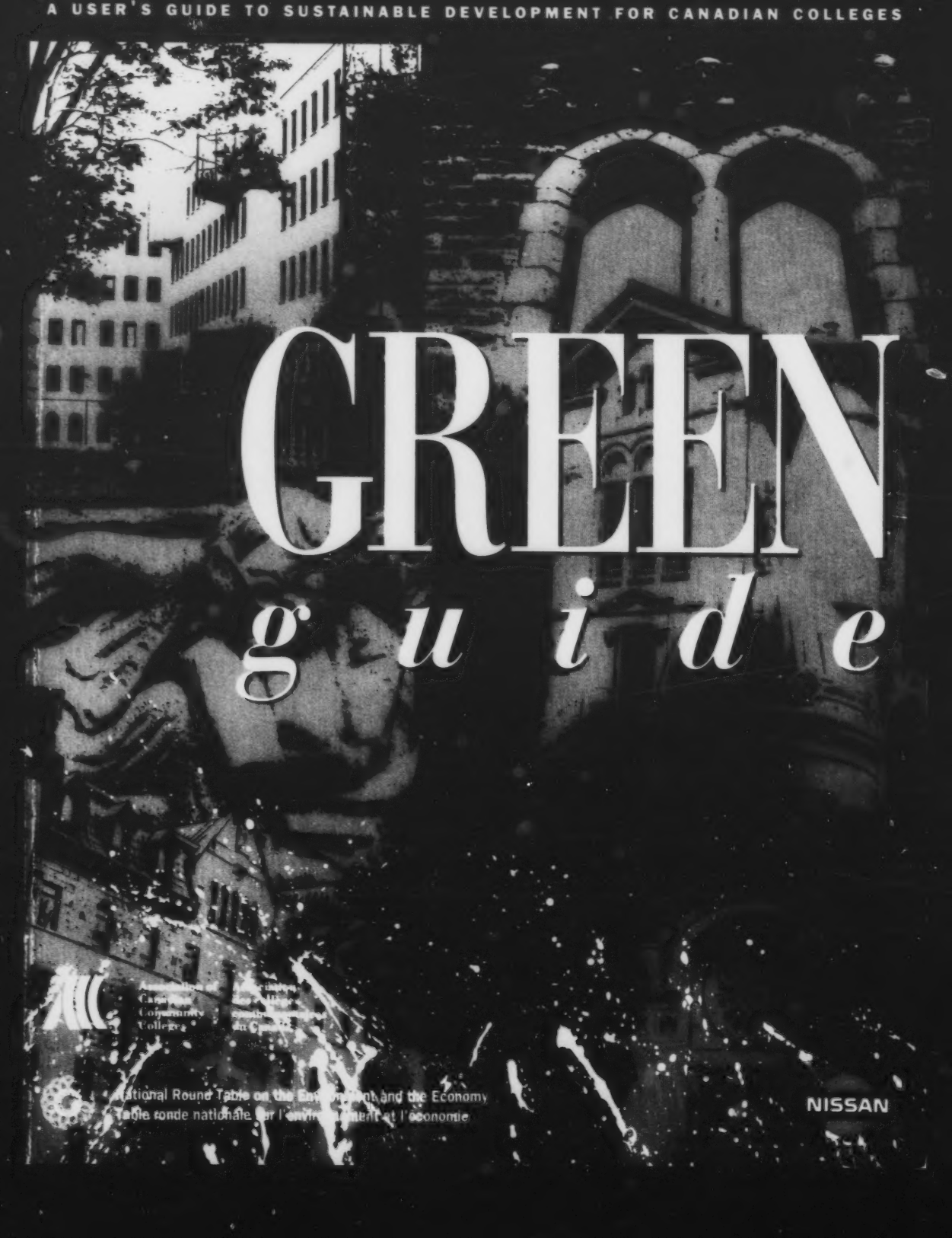
A USER'S GUIDE TO SUSTAINABLE DEVELOPMENT FOR CANADIAN COLLEGES



GREEN *guide*

A USER'S GUIDE TO SUSTAINABLE DEVELOPMENT FOR CANADIAN COLLEGES

National Round Table on the Environment and the Economy
Table ronde nationale sur l'environnement et l'économie

93-02162/

© National Round Table on the Environment and the Economy, 1992
The Association of Canadian Community Colleges,1992

All rights reserved. No part of this work covered by the copyright herein may be reproduced or used in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping or information retrieval systems - without the prior written permission of the publisher.

Canadian Catalogue Information in Publication Data
The Green Guide: A User's Guide to Sustainable Development For Canadian Colleges
(National Round Table series on Sustainable Development)
ISBN 1-895643-16-3

Cover/Book Design
Colton - Temple Design (613)235-1044

This book is printed on Environmental Choice paper containing over 50% recycled content including 5% post consumer fibre using vegetable inks.The cover board also has recycled content and is finished with a water based, wax free varnish.
Printed and bound in Canada by The Alger Press

National Round Table on the Environment and the Economy
Table ronde nationale sur l'environnement et l'économie
1 Nicolas Street, Suite 1500, Ottawa, Ontario K1N 7B7

National Round Table Series on Sustainable Development
1. Sustainable Development: A Manager's Handbook
2. The National Waste Reduction Handbook
3. Decision Making Practices for Sustainable Development
4. Preserving Our World
5. On the Road to Brazil: The Earth Summit
6. Toward Sustainable Communities
7. Trade, Environment and Competiveness

Series General Editor: Daniel Donovan
Tel:(613)992-7189 Fax:(613)992-7385

The Association of Canadian Community Colleges(ACCC)
The ACCC is the national membership organization representing and bringing together some 160 post-secondary, non-degree granting institutions across Canada. These institutions include more than 700 campuses and employ more than 25,000 full-time instructors. The Canadian college and institute system serves some 400,000 full-time and 1.5 million part-time students who are enrolled in well over 1,000 programs and courses.

Now entering its third decade, ACCC was established by Canadian colleges and institutes as a forum for the exchange of information and the discussion of professional ideas among its members. It represents its membership to the federal government, business, labour, and industry leaders. In particular, ACCC can easily access the expertise available from its extensive network of institutions.

The Association of Canadian Community Colleges
1223 Michael Street North, Suite 200
Ottawa, Ontario, Canada K1J 7T2
Telephone: (613)746-ACC Fax:(613) 746-6721

National Round Table Series on Sustainable Development

Aussi disponible en français

Canada

The National Round Table on the Environment and the Economy is committed to the advancement of sustainable development in Canada and around the world. There is today growing appreciation that our planet sustains life through a delicate and intricate web of ecological systems and that human activities have an enormous impact on these systems. To address these issues, while appreciating other needs and issues facing society today, the concept of sustainable development emerged. Sustainable development is a concept which facilitates creative approaches to these issues.

Sustainable development requires partnerships based upon broad coalitions of interest. The formation of such partnerships implies more than just willingness and commitment; it also requires awareness and understanding. The latter can only come with attention to stronger public education efforts on part of governments, interest groups and industry.

The Green Guide is an example of partners working together to achieve a more sustainable society. This book provides an overview of the steps involved in creating an environmentally sustainable college. It is based on case studies taken from colleges across Canada.

The Association of Canadian Community Colleges has embraced the concept of sustainable development and this book proves that they are putting good intentions into action.

George Connell
Chair
National Round Table on the Environment and the Economy

October, 1992

Protection of the environment is one of the most important issues facing all of us today. Good environmental policies are important, but such policies must be put into practise with energy and commitment, if the world's natural resources are to be protected and conserved.

Not only must existing technology be applied to these efforts, but new technologies and strategies must be aggressively developed and effectively applied. In order to accomplish this, it is essential to foster an atmosphere of cooperation between all sectors of Canadian business and industry.

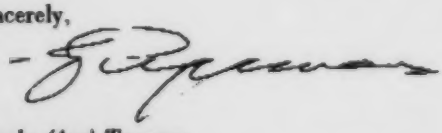
It is in this spirit that Nissan Canada Inc. is proud to support the efforts of the Association of Canadian Community Colleges (ACCC) in the production of their Green Guide.

The Green Guide provides an overview of the steps involved in creating an environmentally sustainable college. In drawing together reports from ACCC member institutions which have undertaken various initiatives to "green" their campuses, it focuses on the principles, strategies and goals which underlie the objective of reducing or eliminating the negative impact such institutions may have on the environment.

This volume will be useful not only to academic institutions, but also to other private sector organizations as a reference for developing and implementing their own environmental programs.

To respond to justifiable concern over the impact of internal combustion engines, Nissan is effecting changes in its own operations to practice better environmental stewardship (eliminating chlorofluorocarbons from our auto air conditioners and manufacturing processes, development of recyclable auto parts, and new electrostatic water-borne painting methods, for example). We are also pleased to participate in this Green Guide project with the National Round Table on the Environment and the Economy (NRTEE) and to applaud the members of the ACCC in their quest for increased understanding and an improved quality of life.

Sincerely,



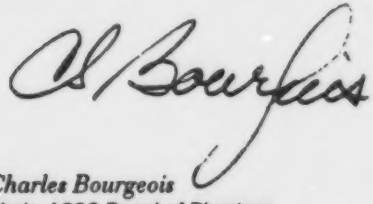
Eisuke (Ace) Toyama
President, Nissan Canada Inc.

In 1990, the ACCC membership made the Environment a priority concern and committed four years to addressing the issues of the Environment within the college and institute system as well as representing the capacity of the colleges and institutes nationally and internationally. With this advocacy issue now formally in its final year, the ACCC is proud to present the *ACCC Green Guide*, a publication which compiles many excellent examples of environmental advocacy work happening with our institutions. With the *Green Guide* we hope to provide our member institutions with information on how they can become more environmentally friendly. We also want to share our experiences with our many business, industry, labour, government, and international partners, and to spread the work that Canada's colleges and institutes can and are making a difference to our ecosphere.

The ACCC is pleased to be working in cooperation with the National Round Table on the Environment and the Economy and appreciates the support this federal agency has provided to us. We are also grateful to Nissan Canada Inc. for sponsoring the production of this publication and for their own commitment to the environment.

And finally, we would like the thank the ACCC Environment Task Group and Green Guide contributors who made this publication possible. The ACCC Task Group members are:

Gerald Brown, John Abbott College
Dr. Brian Desbiens, Sir Sandford Fleming College
David Morgan, Holland College
John White, Durham College
Yvette Swendson, Mount Royal College



Charles Bourgeois
Chair, ACCC Board of Directors

Contents

PREFACE iv

FORWARD v

MESSAGE vi

INTRODUCTION 1

CHAPTER 1: A GREEN VISION 8

CHAPTER 2: INSTITUTIONAL GREENING

Task Force For Sustainable Development: Report and Recommendations
Red River Community College, Winnipeg, Manitoba

- Introduction 16
- The Process 17
- The Report
  - *An environmental Policy for Red River Community College* 19
  - *A. Corporate Citizenship* 20
  - *B. Academic Programming* 25
  - *C. Community Outreach* 28
  - *Conclusion* 30
- Sources of Information 31
- Appendice "A" 32
- Appendice "B" 33
- Appendice "C" 34
- Feedback 37

Education And Training For Sustainable Development: A Model Program Review and Development

- Introcuction 40
- Principles of Sustainable Development for Education and Training 41
- Criteria for Evaluation ofSustainable Development/ Program Integration 49
  - *Application* 52

Education and Training Program Evaluation Guide forSustainable Development
Course/Program operations 54
Course/Program Curriculum 59
Reviewers 64
References 65

CHAPTER 3: THE CASE STUDIES

The Environmental Issues Course–Sir Sandford Fleming College School of Natural Resources, Lindsay, Ontario
Introduction 68
Course History 68
Barriers 71
Teaching Techniques 72
The Future 73

Advocating For the Environment:
The Renewable Resources Technology Program (RRTP) at the Thebacha Campus of Arctic College, Fort Smith
Introduction 75
The Renewable Resources Technology Program 75
Future Advocacy Roles 80
Conclusion 81

Technical Training in Water Treatment: A field fo excellence at CÉGEP Saint-Laurent
Introduction 83
The History of Water Treatment Programs at Cégep de Saint-Laurent 83
Other Environmental Programs 84
Beyond the Regualr Trainingof Youth and Adutls: Custom Programming 85
International Cooperation in the Area of Water Treatment 86
The Specific Nature of the Cégeg's Environmental Interventions 86

Planting Seeds for Sustainable Development: Assiniboine Community College, Brandon Manitoba
Introduction 88
Activities 91
Outcomes 94
Future Programs and Planned Activities 95

The Institue Of Urban Ecology Douglas College, New Westminister, B.C.
Introduction 98
Development of the Institute 100
Barriers and Outcomes 102
Future Prospects 104

Centre For Forestry and Environental Studies
Fisher Institute, Western College of Applied Arts, Technology, and Continuing Education, Corner Brook, NF
Introduction 105
Course History 106
The Centre for Forestry and Environmental Studies 107
Activities 109
Future Aspirations 112

Environmental management tools in a tailor-made training context
Centre de formation en environnemtne inc.
(Environmental Training Centre)
Cégep de Saint-Jérôme - -Saint-Jérôme, Québec
Introduction 114
Custom-Designed Training Services Offered by Centre de formation en environnement inc. 114
Table I 116

CHAPTER 4: TOOLS

Energy Conserving measures Taken at Sir Sandford Fleming College, Peterborough, Ontario
Introduction 120
Actions Taken 120
Project Under Consideration 121
Results 121
Success Factors 122
Barriers 122
The Future 122
Table II 123

President's Advisory Committee Monitoring Our Responsabilities to the Environment The Northern Alberta Institute of Technology
Introduction 124

Environmental And Resource Management Programs
British Columbia and Yukon 138
Alberta and Northwest Territories 147
Saskatchewan 155
Manitoba 158
Ontario 158
Québec 172
Atlantic Provinces 177

Services, Non-credit Programs or Other Activities Implemented in the Areas of Environmental and Sustainable Development 182

Canadian Environmental Organizations
National Organizations 185
Provincial Organizations 186

International Organizations 190

NRTEE MEMBERS

DR. GEORGE CONNELL, *CHAIR,*
National Round Table on the Environment and the Economy

R.C. (REG) BASKEN *President,* Energy and Chemical Workers Union

FRANCOISE BERTRAND *Presidente-directrice generale* société de radio-television Du Québec

THE HONOURABLE CAROL CARSON *Minister of the Environment,* Government of Saskatchewan

THE HONOURABLE JEAN CHAREST *Minister of Environment,* Government of Canada

THE HONOURABLE J. GLEN CUMMINGS *Minister of Environment,* Government of Manitoba

PAT DELBRIDGE *President,* Pat Delbridge Associates Inc.

THE HONOURABLE JAKE EPP *Minister of Energy, Mines, and Resources,* Government of Canada

JOSEFINA GONZALEZ *Research Scientist,* Forintek Canada Corp.

DIANE GRIFFIN *Executive Director,* Island Nature Trust P.E.I.

DR. LESLIE HARRIS *Memorial University,* Newfoundland

TONY HODGE *School of Planning,* McGill University

SUSAN HOLTZ *Senior Researcher,* Ecology Action Centre

JOHN E. HOUGHTON *Chairman,* Québec and Ontario Paper Company Ltd.

PIERRE MARC JOHNSON *Directeur* Centre de médecine, d'éthique et de droit de l'Université McGill

DAVID L. JOHNSTON *Principal and Vice-Chancellor,* McGill University

DR. GERALDINE A. KENNEY-WALLACE *President and Vice-chancellor,* McMaster University

MARGARET G. KERR *Vice-President Environment, Health and Safety,* Northern Telecom Limited

LESTER LAFOND *President,* Lafond Enterprises Ltd.

THE HONOURABLE JOHN LEEFE *Chair,* Canadian Council of Ministers of the Environment (CCME)

JACK M. MACLEOD *President and Chief Executive Officer,* Shell Canada Ltd.

JIM MACNEILL *Senior Fellow,* Sustainable Development Program,
Institute for Research on Public Policy

THE HONOURABLE DONALD MAZANKOWSKI *Minister of Finance,* Government of Canada

DAVID MORTON *Chair and Chief Executive Officer,* Alcan Aluminium

LISE OUELLETTE *Coordonnatrice* de la federation des agriculteurs et des agricultrices francophones du Nouveau-Brunswick

DR. BOB PAGE *Faculty of Environmental Design,* University of Calgary

LEONE PIPPARD *President and Executive Director,* Canadian Ecology Advocates

JUDGE BARRY D. STUART Territorial Court of Yukon

THE HONOURABLE MICHAEL WILSON *Minister of Industry, Science and Technology and Minister for International Trade,* Government of Canada

EXECUTIVE DIRECTOR: Ron Doering

Introduction

News of our deteriorating environment has become a daily occurrence. The concerns of the 1960s and '70s with localized environmental horror stories have been superseded in the 1990s by global warming, erosion of the ozone shield, a planetary population which is doubling every generation, steadily decreasing agricultural productivity, loss of species, pollution of fresh water supplies, acidification of forests and crop lands, accumulations of toxic chemicals and radioactive wastes. Some authorities hold that we are facing an environmental crisis of unprecedented scale and tragedy. Others maintain that we are seeing environmental symptoms and consequences of a particular approach to making our living in the world, i.e., to development. The crisis is at root a cultural and developmental crisis the resolution of which will be mirrored, for better or worse, in our physical and social environments.

Concern for these matters must touch every community college and institute of technology in Canada and all members of ACCC. The colleges and institutes have a major role in diffusing knowledge of existing technologies among practitioners in our own labour force. Colleges and institutes also play a major role in Canada's efforts to share its technology and expertise with developing nations through international training agreements.

In addition to the dissemination of applied technical training, our institutions are also an important focus of community development. Within their respective regions, colleges and institutes are vital training centres for a wide range of roles in society and the economy where decisions will be made about the allocation and use of physical, biologic and social resources. The attitudes which are fostered in children through contact with childcare workers are no less important to the future of environmentally sound development than are the skills of technicians and engineers. Office workers and clerks make decisions about the use of resources the same as agricultural producers and resource management specialists. It would be hard to imagine any area of training in Canada's community colleges and institutes of technology which will not be affected to some degree by the urgent challenges we now face in discovering and applying more environmentally sustainable forms of development activity.

Awareness of this challenge and the responsibility it implies has grown among the members of ACCC. In the summer of 1990, the Association responded by establishing its Environment Task Group. The Task Group's role included identifying environmental issues of concern to colleges and institutes, surveying member institutions regarding their perceptions, activities and needs with respect to environmental concerns, and recommending strategic objectives to ACCC's Board. In January 1991, a consultation was convened in Hull, Quebec, attended by representatives from sixty colleges and institutes to further identify the needs and interests of ACCC members. Among the twenty-five initiatives proposed by the Task Group to the Board were measures aimed at providing more environment-related information services to its members. Specifically, information was requested on practical steps to "green" their campuses. The Green Guide is an attempt to respond to these requests.

The Green Guide and Sustainable Development

Critical to the contents of the Green Guide is the concept of sustainable development, the meaning of which is intuitively obvious: development which can be sustained over time. In practice, however, there have been many attempts to enlist this ambiguous term to all sorts of political, economic and ideological agendas. Some say sustainable development is an oxymoron in a finite biophysical system. Others believe that calls for sustainable development sanction another round of economic growth only fuelled by cleaner technologies. It is important, therefore, to explore this concept and try to clarify it so that it can find meaningful application in education and training reform.

The classic definition of sustainable development from the report of the World Commission on Environment and Development (1987) - "...sustainable development is development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs." - makes sense when referring to activities which utilize renewable resources, but is clearly self-contradictory when referring to non-renewable resources.

The World Conservation Strategy (1990) defines sustainable development as, "improving the capacity to convert a constant level of physical resource use to the increased satisfaction of human needs." While perhaps requiring more than one reading, this definition has the virtue of not being self-contradictory. In an ecosystem which is in a steady state of dynamic equilibrium, the total stock of renewable and non-renewable

resources is constant. From this constant but limited supply, human beings seek to meet their needs and improve their lot through development.

It is easier to identify "unsustainable" forms of development than to point out positive examples. Concern for sustainable development has arisen because current approaches to development are destroying the biophysical systems which maintain life. At minimum, then, sustainable development must mean something different from business as usual. This is an important point because part of the way of life denoted by sustainable development is yet to be created.

To sustain means to persist or maintain through time. Critical here is what we hope to sustain. Clearly, we hope to sustain our species, our cultures, our economic and social well being, our options for future realization of our potentials, as well as the intrinsically valuable world of nature. But except for the ecosphere itself, all of these are emergent products of human activity which depends totally upon the sustenance of the ecosphere. Without environmental sustainability, any discussion of economic or social sustainability is moot.

Since human cultures, economies and goals are far more malleable than the ecosphere, it is the human side of the relationship which must change if sustainability is to be achieved. Thus we seek first to devise living arrangements which allow sustenance of the ecosphere, and growing from it, the sustenance of human livelihood. We cannot afford to insist upon sustaining particular communities, technologies, economic interests, power elites or traditions when to do so would continue destruction of the ecosphere.

The onus here is clearly on human beings. Believing we can attain environmental sustainability through the design of organisms and systems which can tolerate human destructiveness and exploitation is naive and misguided. It is our own behaviour which is the crux of concern and the ways in which we outfit ourselves for livelihood, i.e., the ways in which we go about education. The so called "environmental crisis," real as it is, is the consequence of our behaviour, not the environment. Attending to the environment while ignoring our behaviour simply avoids the critical issues involved in cultural transformation.

Equally important is the concept of development which is not synonymous with growth. Development is often associated with economic

growth, though nothing in nature grows without limit except cancer. There are many examples of development which is not attended by quantitative growth, as when a person learns new skills, develops new appreciations, matures through experience, etc. The transition from the vacuum tube to the micro-circuit is an example of technical development which has actually decreased the demand for energy and resources. Electronics is a shrinking industry in a physical sense while it remains a highly dynamic and developing industry in terms of capacity, sophistication, and elegance of application.

Development thus refers to meeting human needs and realizing aspirations through qualitative improvement. For some people, e.g., those living in developing nations, development still requires growth in the absolute quantity of goods and services available. For other countries, sustainability of the ecosphere can be maintained only by abandoning practices which continue to promote quantitative growth in use of resources and energy, although qualitative improvement of cultures, social systems, political life and artistic creation can certainly continue. It is also possible to imagine continued economic growth in the developed countries if the basis of this growth is found in non-resource and energy intensive sectors of the economy, e.g., information industries, electronics, services, etc.

Traditional approaches to "development" as economic growth threaten our future because "development" from the human perspective usually degrades the ecosphere. This is true both for technical and traditional cultures. But technology confers enormous power to exploit and degrade the landscape to a degree which has never before been possible for small human populations with simple technologies.

Degradation of the ecosphere is not limited to human economic motives. The human-ecosphere relationship is also affected by social realities, by distributions of power and influence, by political and cultural events such as wars, racism, sexism, and nationalism. Less accustomed to thinking about these things from an environmental perspective, they can be confused with their economic implications. Nevertheless, a landscape can be exploited for economic profit, and also to achieve political purposes, to provide sacrifice for one's gods, to establish national prestige, to strike a blow in favour of some political or social cause. Moreover, the ecosphere can be degraded for lack of the creative contributions of systemically disenfranchised groups, e.g., women, visible minorities. For these reasons, sustainable development must include a strong social, political and regu-

latory dimension as well as its economic and environmental dimensions.

In a positive sense, then, "sustainable development" names a pattern of human social and economic behaviour which integrates harmoniously with the realities and limits of the ecosphere. We do know something about how to live sustainably, but not everything. The transition from our present way of life will therefore entail both the application of existing knowledge of sustainable livelihood, the recovery of lost and disvalued traditional knowledge, and the invention and discovery of new knowledge.

Sustainable development clearly cannot mean "sustainable growth" (impossible in a finite system), or simply applying our creativity to maintain the status quo. It names a goal which calls for continuous self-transformation at the individual, community and national levels.

Who is sustainable development for?

Generically speaking, sustainable development concerns the whole world. The nature of the ecosphere dictates attention to the profound interconnectedness of living systems, of atmospheric and ocean flows, of the movement of nutrients, gases and water in the earth's circulatory systems. Furthermore, the increasing interdependence of national economies through trade, and the cultural and social linkages resulting from modern travel and communications make social interconnectedness a reality as well. The most pressing ecological dangers are precisely those which are of planetary scale and whose solution requires international cooperation. Because of the integrity of the ecosphere, all of Earth's people share a common interest in sustainable development.

The operational meaning of sustainable development will depend on geography, economic and social factors, historical and cultural realities, and bioregional opportunities and limits. People in developing nations are rightly suspicious of those who would make sustainable development a new agenda for economic exploitation of the Third World. While sustainable development is clearly an international concern, the appropriate place to begin in developed (some would say overdeveloped) countries is to achieve sustainability within our own societies rather than try to export expertise we clearly do not have. To the extent that innovation of any kind attempted anywhere contributes to authentic sustainable livelihood, it will indirectly benefit everyone everywhere.

The Green Guide has been organized into four major sections:

Chapter I:
A GREEN VISION is an attempt to portray one image of what a future "green college" might be like. Visioning is a very personal process and many dreams will have to be dreamed and shared in meeting the challenges of the future. This chapter of the Green Guide, however, was written while "steeping" in the proceedings of the Hull consultation. It attempts to synthesize as well as develop and advance the characteristics which ACCC members would use to describe an environmentally sustainable college.

Chapter II:
INSTITUTIONAL GREENING includes contributions which describe the process of transition to more environmentally sensitive college/institute operations, mandates, policies, management styles, and organizational characteristics. Its focus is on principles, strategies and goals.

Chapter III:
THE CASE STUDIES draws together reports from member institutions in all six ACCC regions which have undertaken various initiatives to green their campuses. Rather than presenting promotional statements, we have endeavoured to gather realistic accounts of less-than-perfect human beings coming to grips with the environmental challenges posed by their institutions and training mandates. Much can be learned from mistakes as well as success stories.

Chapter IV:
TOOLS was assembled to identify resources and provide practical tools which can be used in the transition to greener colleges and institutes of technology. This section includes samples of models for environmental audits, samples of fiscal planning tools and payback calculation models for specific interventions, a directory of environment sector training programs in member colleges/institutes, a directory of environmental organizations. This section is not, of course, exhaustive of the literature and experience available within ACCC member institutions, but we hope it represents a useful sampling.

CHAPTER 1

A GREEN VISION

A green vision

They say that when the change started to happen it was more a matter of spirit and consciousness than technology or policy—-at least at first. Many people in many places started to think of technology as a tool that could be used to realize all sorts of different futures, not just one future. And we began to realize that policies express values and choices, and that these are born both in our experiences and our dreams. Our world began to change when our dreams and aspirations changed. This happened in so many places, in so many hearts, in so many innovators and thinkers and doers that we cannot point to individual heros in those early days of floodtide change. Large numbers of people became increasingly aware of our gathering environmental calamity, aware of the limitations of the traditional ways of meeting our needs, and conscious of the need for fundamental change. Sometimes we felt overwhelmed and darkened by this awareness. At other times, the very nature of our dilemma kindled an ancient fire within us which had, from the beginning of our evolution, provided the source of our creative response to change. Our fellow species change their bodies in order to evolve. Human beings change their minds, their hearts, and their cultures.

Among the leading catalysts in this process were Canada's colleges and institutes of technology. They themselves became models within their communities of the changes they helped to foster. Today, we can see the results of this change in consciousness in how these educational institutions look, how they are built, how they are managed, how it feels to live and work in them, what people learn by going there, and the attitudes and values which are nurtured through their programs and activities.

Good examples of these changes can now be found almost everywhere, although many colleges and institutes are still in transition. We expect that we will always be more or less in transition as our knowledge grows about how to harmonize human activities and needs with the living world. But few examples are better than the campus of Gaia College in Enviroville, Canada.

Those who still remember the "ambience" of a technical college campus in the late twentieth century appreciate the difference in the "green colleges and institutes" of today. It is something that floods in through

every sense and every conversation. The college has been built with respect for the earth. The people teaching and learning at Gaia, no matter what their discipline or specialty, think of themselves as "earth keepers."

The Lane Centre for Applied Sustainable Technology at the Gaia campus is a good example of the new generation of non-disposable buildings. Designers realized that it was more conserving of resources to build once, well, rather than repeatedly and badly. The Lane Centre was designed for a 1000 year service life. No one was surprised to learn that this didn't cost fifty times more than a similar building designed for a 20-year service life. Exterior landscaping was an integral part of the building design. Even though it is located in a relatively northern latitude, its primary heating and cooling systems consist of insulation and super-efficient windows. Much use has been made of passive solar principles and the use of trees, shrubs and land formations to assist with building comfort. When Mitel Corporation introduced photo-voltaic panels which were integral building elements, they were worked into the facades and decorative details of the structure itself. During the long, bright Canadian summers, solar generated electricity is converted to hydrogen gas and stored to supplement heating and energy needs through cogeneration during the winter. The building was sized and designed to live within its own energy cycle budget.

The inside of the Lane Centre was not decorated so much as landscaped. When architects began to acknowledge that people in Canada spend a healthier and more pleasant winter when their indoor environments are richly textured, varied, colourful and alive, decors began to shift toward a renewed use of stone, wood, bricks, plants, water and gravels, sand and rocks. The living "decorative elements" also provided important indoor air quality services and a subtly changing environment as plants grew, blossomed, multiplied or were replaced.

The trash bins and recycling containers so common in the twentieth century have nearly disappeared. Recycling is a standard part of college/institute life, but much more work has been done on reducing wastes at source. Food services use only durable cutlery and dishes, paper has been largely (though not totally) replaced by electronic messaging and information storage systems. Many students use portable computers with CD ROM libraries for course work. At first, many people thought this innovation was the stuff of science fiction until a researcher at Red Deer Community College showed that the Province could provide

free laptop computers and CD ROM readers to every student when the total life-cycle costs of conventional books, magazines, journals, paper, paper mills, transport costs, the storage costs of maintaining large libraries, road wear during shipments of traditional school supplies, landfill disposal costs, compensation claims for injuries in the shipping and publishing business due to heavy lifting, and water and air pollution cleanup costs were all factored into the decision.

Vegetarianism prevails and, of course, smoking is now considered unacceptable in terms both of personal health and polite company.

The Gaia campus is a quiet place. This would not have been the case in the late Twentieth Century. Gone are the hydrocarbon fumes and engine noise so familiar in those days. Electric and PV-hydrogen powered vehicles have largely replaced the old cars and there are far fewer of them. The campus was designed around the needs and abilities of pedestrians. Buildings have been clustered according to the functions and activities they support, and integrated with student residences, shopping, sports and entertainment facilities. These in turn have been situated for easy access to Enviroville's transit system.

Changes in decor and building technology, as important as they were to conserving resources and minimizing environmental damage, were the easy part. Gaia College is not primarily its buildings, solar panels and flower beds. It is much more a vessel within which the skills, attitudes and values of citizens are shaped, nurtured and challenged. The contributions made in this area were the work of every staff person, instructor, administrator and student who got involved. Some of the most important beginnings came from simple, rather undramatic changes.

A carpentry instructor started describing wood, not as a dead physical substance with certain properties, but as a living gift of nature. Her attitude, that wood was a material to be respected, shaped carefully and used judiciously was something that students in the program could see in every gesture, the planning of every learning activity. They could feel the instructor's expectation that as workers in wood, they had not only an economic role as productive employees, but also an environmental role in sustaining the planet which made their trade possible and a social role to express through their work the pride in excellence which once characterized the medieval trade guilds.

A health services instructor explored with students how human health is a

function not only of disease organisms, but of the total person-environment relationship. Through their discussions, the work of health care professionals acquired new meanings no longer limited to the treatment of pathology, but open instead to the full range of actions (and inactions) which prevent human sickness through training which creates and maintains healthy environments.

A major contribution to this cultural shift was made by members of Canada's First Nations. Greater participation of aboriginal people in all aspects of training, decision-making and instruction helped inject alternative perspectives of the use of time, the sacredness of nature and the earth, the importance of strong community values, pride in history and heritage. The First Nations managed to re-introduce Canadians of European origin to their own ancient but long slumbering awareness of nature as a conscious subject rather than a lifeless object to be exploited. The "aboriginalization" of the Canadian national consciousness helped us see life in community over many generations and connected to many species. This counterbalanced our frenzied efforts to out-compete the United States with a deepened understanding of development as a process which involves much more than economic values.

Administrators and managers at Gaia also began to understand new aspects of their roles. Their concern for the cost effectiveness of college operations continued, but these decisions gained a new context when the environmental and social aspects of sustainable livelihood were included in decision-making. College managers came to see their role partly as stewards of a public trust through the institutions they managed, and partly as environmental stewards concerned that their colleges leave small footprints on planet earth. The cost efficiency of traditional operating policies was then counterbalanced by the effectiveness of policies to merge the physical and human activities of the campus with its environment. Poor communication, weak strategic planning, perverse systems of accounting and management, decision-making which disenfranchised members of the college community affected by the decisions, failure to welcome the creative contributions of everyone in the college were all shown to be causes of wasted money but also pollution and wasted resources. Many realized that progress toward a greener campus involved human development, staff education, and changed administrative procedures as well as pollution controls and recycling. Colleges without environmental policies, codes of practice and environmentally sensitive mandates became quaint anachronisms.

A watershed in administrative practice was reached when special environment committees, task forces and project groups were abolished from college organizations. This happened fairly quickly when a few simple linkages were recognized. College administrations existed to provide guidance and support to the future evolution of education and training. But unless environmental and social considerations were integrated into all management decision-making, eventually no human future worth discussion would be possible. This would signal the end of all administrations. Therefore, environmental and social awareness became essential concerns in all management decisions and all enlightened management practice. Setting up special bodies to deal with matters of such central importance to everyone came to be seen as a way of avoiding responsibility as well as foregoing opportunities to make contributions. Needless to say, the transition to "involvement" occurred rather quickly.

A major step in the greening colleges and institutes of technology involved curriculum. The environmental movements of the '60s and '70s added more courses on environmental issues, environmental science, resource management and pollution control. These were necessary and important achievements. But these institutions made even more progress when environment issues were no longer relegated to special courses. Rather, environmental impact was a continuum along which every course or program could be ranged. When all college/institute activities were designed from biocentric as well as economic and educational perspectives, objectives could be included in every program to sensitize students to the ecosphere impacts of their training and eventual employment activities. For some programs like mathematics, the implications were modest. In other programs such as agriculture, mining, resource management, administration, and the technologies, the implications were profound and thoroughgoing. As this awareness became more widespread, it triggered the most pervasive transformation of curriculum since the introduction of systematic instruction. Suddenly we realized that even the decision to bring students together in classrooms rather than using distance delivery methods had environmental and social implications.

Much of this required a basic change in our approach to doing almost everything. In the '80s and '90s, programs, buildings, products and gadgets were designed, then their environmental impact assessed, then clean-up and amelioration measures added at the end to reduce environmental and social harm. The real green colleges were born when people started rethinking their activities from the ground up. Instead of cleaning up auto exhaust after we created it, we started to invent new ways of getting

people from place to place. Instead of recycling paper from our classrooms, we designed teaching strategies that didn't require paper.
We also worked on program delivery strategies which helped sustain the families and communities which were the primary social structures of our society. We did this by increasing community-based training and distance delivery of programs. Gone were the days when students had to commute to classes, or relocate themselves or their families, far from community and extended family supports in order to participate in training. Community-based training helped save resources and fuels at the same time it helped reduce student attrition due to "culture shock" and the stresses that accompanied separations.

When education and training became ways of learning how to integrate meeting human needs with ecological and social realities, the colleges and institutes became more active partners in community development. The concept of "partnering" also helped name another significant shift in consciousness — the movement toward more inclusiveness and participation in all aspects of community/regional development. How to make the transition toward a greener institution came to be understood less in terms of the "enlightened leadership" of the few given to the many and more in terms of discovering ways of promoting synergy, creativity, and capturing the unique contributions of each person toward a shared community goal. People ceased to be viewed as "human resources" and came to be seen as vital centers of creative conscious awareness, insight and perception. Participation then ceased to be a empty form designed to defuse dissent and became instead the vessel within which the full collective wisdom of the community could be applied to the creative challenges of living in harmony with the ecosphere.

It is easier to identify these changes now, in retrospect, than it was to see their operation at the time. Had someone come forward with a detailed agenda for the transition to "green college/institute" status, it probably would never have happened. What did happen, however, was the emergence of a shared awareness that our customary ways of living, learning and building our culture had to change, and a shared willingness to begin exploring alternatives and actions. What twenty years ago would have been called a "green dream," came into being through the dreams of all of us, dreaming a new dream for our future, a little bit at a time.

CHAPTER 2

INSTITUTIONAL GREENING

Task force for sustainable development:

REPORT AND RECOMMENDATIONS

RED RIVER COMMUNITY COLLEGE - WINNIPEG, MANITOBA, MARCH 1992

INTRODUCTION

The College Task Force for Sustainable Development was initiated by the president of Red River Community College in the fall of 1990. The purpose of the Task Force was to provide coordination, advice and recommendations on sustainable development policy and initiatives at the College to ensure that it fulfils its function as a good corporate citizen.

The members of the Task Force are employees of Red River Community College who volunteered their time and energy to a cause in which they strongly believe. The members are: Pat Bozyk, Andy Burzynski, Bernie Gross, Hakam Joll, Don Kennedy, Otto Kirzinger, George Martens, Roy Pollock, Dale Watts, Ken Webb, Jack Kaplan (retired), Paul Millan (to June 1991) and Wayne Todoruk (from September 1991).

The Task Force acknowledges the influence of the international Brundtland Commission and has attempted to incorporate the essence of its "call to action" within the guidelines and principles espoused by Canada's subsequent Task Force and Manitoba's Round Table on Environment and the Economy. There are three fundamental objectives - economic, environmental, and social -which must be met if sustainable development is to occur. However, there are numerous constraints and barriers to accomplishing these objectives which include a lack of information, funds, methodology, compliance enforcement, structure, and societal will.

Although there are limitations on the influence the College can have on the community as well, there are some measures the college can take to improve the sustainable development situation within its purview. These measures include:

- developing an environmental policy for the college;

- creating a Office of Environmental Affairs to be managed by an environmental coordinator;
- establishing a permanent environmental committee;
- conducting environmental assessments or audits;
- fostering sustainable development partnerships with business and industry;
- increasing environmental awareness and participation through education;
- adopting environmentally appropriate procurement, conservation, transportation, materials usage, and wellness activities and practices;
- developing new "sustainable development" academic programming and promoting community outreach activities.

As a good corporate citizen determined to promote responsible sustainable development practices, Red River Community College has an obligation to implement sound, comprehensive policies within its own organization, to educate its employees and students about sustainable development and to develop and support ongoing partnerships with business and industry now and in the future. To fulfil its obligation, Red River Community College should focus particularly on what it does best - providing in appropriate training and education.

THE PROCESS

This report was developed through a multi-step process. The Task Force solicited input from academic and service areas of the College to identify the current status of academic programs, personnel involvement, and College actions as they relate to environmental issues. Pertinent information was gathered from external sources including public and private sectors. Submissions were encouraged to develop recommendations for future directions.

THE REPORT

This report is intended for Red River Community College and the community it serves.

RRCC offers a full range of over 70 post-secondary diploma and certificate programs in the fields of applied business, health, family and applied sciences, technology, trades and apprenticeship. To assist in the process of lifelong learning, the College also offers a comprehensive array of courses for part time learners in southeastern Manitoba. With a main campus on a 160-acre site in Winnipeg, numerous off-campus delivery sites and regional centres in the Interlake, Pembina Valley, Portage la Prairie, Selkirk and Steinbach, RRCC is well positioned to serve an annual student population of 29-30,000.

Red River Community College's vocational and technical training programs are developed and maintained in close consultation with industry through a series of Program Advisory Committees with representatives from business, industry, government and professional organizations. This network links the College with the marketplace and works to ensure that graduates are able to meet and exceed the standards and requirement of a modern workforce.

The sustainable development initiative in the College must ensure that any recommended activities adhere to the principles of the College Mission Statement, the objectives of the Strategic Plan and the proposed guidelines of the Total Quality Management Implementation Team.

ABOUT THE RECOMMENDATIONS

It was acknowledged that sustainable development may require some fundamental changes in College efforts, structures and resources. The kinds of recommendations the Task Force proposes in this report cannot be limited to simple and typical "do this or that" recommendations. The "this or that" is not always obvious when it comes to sustainable development. However, this report does include some very specific and doable examples.

Community learning processes are an important part of the College's recommendations. The public need to learn together. Recommendations for working groups that are collaborative and broadly based, public forums, staff training and workshops, etc. reflect this priority. These processes are intended to help the public deal with new situations for which there are as yet no rules, no plans and only limited understanding.

Specific policies, structures and programs are also needed to implement sustainable development and are recommended as well. Recommendations that emphasize broad education and information have indirect and longer-term payoffs relative to such specifics as college policies, industrial activities, and community projects.

STATEMENT OF ENVIRONMENTAL PRINCIPALS FOR THE COLLEGE

Many corporations and post-secondary educational institutions have approved an environmental policy which establishes the institution's goals and provides guidance in the area of environmental awareness.

THE TASK FORCE RECOMMENDS THAT RED RIVER COMMUNITY COLLEGE ADOPT THE FOLLOWING ENVIRONMENTAL POLICY:

An environmental policy for

Red River Community College

In its role as an educational institution, an employer, a corporate citizen and a property manager, Red River Community College recognizes that it has a special responsibility to conduct its activities in an environmentally sound manner.

Red River Community College realizes its diverse academic and operational activities can have significant impacts on the environment. The College believes it should take a leadership role in environmental management.

Therefore, it is the policy of Red River Community College to strive to conduct its activities in ways that do not cause unacceptable degradation of the environment. The cornerstones of the College's environmental policy are the following:

1. RRCC will offer academic choices that will ensure that its students, employees and the broader community have opportunity to become well-versed about environmental issues and solutions.

2. RRCC will strive to conduct all its activities in way that are environmentally appropriate. The College will encourage its employees to speak out on environmental issues, as well as on the social, economic and industrial aspects of sustainable development.

3. RRCC will strive to achieve a healthy working and educational environment.

4. RRCC will manage its buildings and grounds in ways that are environmentally appropriate.

5. RRCC will play an exemplary role by ensuring that its corporate operations become as environmentally sound as allowed by technology, economics, and common sense.

It is the expectation that all persons and units affiliated with RRCC will strive towards the attainment of the environmental objectives.

RECOMMENDATIONS

The parameters considered for RRCC include:

A. corporate citizenship,
B. academic programming, and
C. community outreach.

A. CORPORATE CITIZENSHIP

In defining the College role as an exemplary corporate citizen, the Task Force endeavoured to determine the initiatives of other corporations and educational institutions.

A Conference Board study reported that more than 85% of the corporations surveyed viewed environment matters as actions reflecting social responsibility. Many corporations had formal a statement of environmental policy. The corporate position on major environmental issues was most often publicly expressed by executive officers and, in most cases, the VP-Environmental Affairs. However, developing environmental policy is often the responsibility of an administrative or operations officer at an executive level. An Officer of Environmental Affairs is at times present, with definite functions (see Appendix A).

ADMINISTRATIVE RECOMMENDATIONS : Once an environmental policy or code of conduct has been adopted, the College should demonstrate environmental leadership through exemplary practices. Therefore the Task Force makes the following recommendations:

A.1 An environmental coordinator should be appointed.

A person is required to coordinate, research, and develop programs and initiatives within the College. The terms of reference of the coordinator could be similar to the activities carried out by the Office of Environmental Affairs described in Appendix A. The coordinator would monitor College adherence to environmental policies and procedures and progress towards implementing sustainable development.

A.2 A permanent environmental committee or advisory body should be established reporting directly to the President.

The composition of the committee would include College employees as well as community representatives. The committee would be chaired by the environmental coordinator.

A.3 All College members should be made accountable for the environmental implications of their actions.

Mechanisms such as annual reports, department audits, job descriptions, individual performance appraisals and work plans should reflect environmental concerns.

A.4 Environmental self-assessment procedures such as environmental audits should be developed.

The establishment of an environmental audit procedure for the College would be the responsibility of the environmental coordinator.

A.5 The College should take a proactive position on environmental issues and communicate these effectively to businesses, government, and the public.

A.6 Partnerships should be created with business and industry to help achieve a healthy environment.

Specific activities could include:

a. representation on panels, boards, committees (see Appendix B)
b. demonstration of projects with industry
c. exchange of personnel
d. transfer of environmental technology programs
e. communication of success stories
f. participation in environmental trade fairs
g. acquisition of financial assistance for innovative projects through such available funds as:
   i) The Environmental Innovations Funds
   ii)The Environmental Partners Fund
h. participation in trade and professional organizations.

A.7 RRCC should educate its employees about dealing with environmental issues, complying with environmental laws, and benefiting from environmentally sound practices.

Courses on sustainable development should be offered to all staff; participation should be encouraged and acknowledged both publicly and in personnel records.

A.7.1 RRCC should increase environmental awareness in its employees by:

a. producing a newsletter or regular articles (a byline)
b. organizing staff in-services
c. organizing environmental fairs
d. creating "eco-tip" fact sheets
e. planning "eco-trips"
f. working on environmental projects such as tree planting/maintenance, etc.
g. producing a periodic "environmental report card."

A.7.2 RRCC should encourage individual staff participation by developing and promoting a reasonable list of activities.

Some examples are:
a. composting
b. recycling
c. planting trees, shrubs
d. organizing car pools
e. promoting energy conservation
f. reusing envelopes
g. encouraging reusable lunch containers, coffee mugs, etc., and
h. starting an eco-lympics.

A.8 The College should ensure there is an adequate information base on sustainable development to meet its needs by increasing library holding in print, AV, and electronic formats.

Procurement Recommendations

A.9 The College should adopt procurement policies that favour secondary (recycled), reusable, refillable, non-toxic and low-waste materials.

Specific activities could include:

a. buying office and other supplies made from recycled paper (business cards, toilet paper, napkins, etc.)
b. using nontoxic fluids, cleaners and others, supplies such as:
   i)water-based glues, markers, inks, paints
   ii)janitorial supplies
c. buying refillable materials as opposed to disposables such as pens, batteries, etc. and purchasing materials in bulk
d. using non-aerosol products
e. using products recommended by Environmental Choice Program
f. encouraging suppliers to change packaging materials to reduce waste
g. encouraging the use of natural packaging that is biodegradable, recyclable, or produced from used materials
h. reducing the use of disposables such as cups, plates, utensils, etc.

Operations Recommendations

The College should start "greening" its own operations. More and more businesses are implementing greening programs and the College should show leadership in this area.

A.10 The College should encourage activities/practices that promote a reduction in energy consumption and encourage conservation.

Specific activities could include:

a. establishing energy audits such as those offered by Manitoba Energy and Mines
b. ensuring that energy-efficient standards and guidelines are used for equipment, new and old buildings and other materials
c. installing modern energy-efficient equipment and lighting
d. installing water-conserving devices
e. establishing electricity use-reduction targets
f. reducing air pollution through energy-efficient heating and cooling (sick office syndrome)
g. promoting more efficient use of facilities for evening and weekend courses.

A.11 RRCC should promote more efficient office practices.

Specific activities could include:

a. using double-sided copies
b. reducing the number of copies through circulation
c. promoting electronic mail
d. recycling used paper into memo pads
e. posting general information memos instead of distributing copies
f. using remanufactured laser printer cartridges.

A.12 RRCC should encourage more efficient use of transportation.

Specific practices could include:

a. promoting public transportation
b. developing incentives for car pooling
c. maintaining college vehicles for fuel efficiency and emission reduction
d. promoting teleconferencing
e. promoting walking and biking to work.

A.13 RRCC should promote a more efficient use of materials in academic classes.

Specific practices could include:

a. promoting microscale labs
b. using double-sided photocopying for student handouts/exams.

A.14 RRCC should encourage practices to promote the health, well-being and safety of its employees and students.

Specific initiatives could include:

a. developing a policy on laboratory and shop safety
b. restricting smoking to designated areas
c. controlling hazardous materials and wastes
d. emphasizing UV radiation protection due to ozone depletion
e. encouraging a healthy lifestyle through nutrition, exercise, etc.
f. encouraging the use of ergonomic furniture and non-toxic building products.

Disposal Recommendations

A.15 The College should minimize the amount of waste it produces.

Specific practices could include:
a. conducting a waste audit
b. improving the recycling of paper, cans, plastics, etc.
c. reusing or offering for reuse materials that cannot be recycled
d. composting and/or waste segregation.

International/Global Recommendations

A.16 The College should ensure that all its international education initiatives have an environmental component.

The transfer of technology, accompanied by education and training, to developing countries needs to be quickened, with suitable commercial safeguards and equal emphasis on strengthening environmentally appropriate local practices. Ending hunger and malnutrition will continue to be a predominant concern of the poorest countries.

A.17 The College should support in principle the activities and programming of international organizations.

Some organizations with a strong environmental emphasis are:
a. International Institute for Sustainable Development (IISD)
b. United Nations Environmental Program (UNEP)
c. United Nations Educational Scientific & Cultural Organization (UNESCO)
d. Canadian International Development Agency (CIDA)
e. International Chamber of Commerce (ICC)
f. World Health Organization (WHO)
g. Organization for Economic Co-operation and Development (OECD).

B. ACADEMIC PROGRAMMING

Education is RRCC's commitment to the future. In the last few decades, accelerating trends in environmental destruction have called into question the survival of the planet. Many scientists have warned that the present decade may be the last chance to reverse the trends and for humans to renegotiate their relationship with the environment. A key role for education today is to encourage the knowledge, skills and commitment need-

ed to accomplish these goals.

RRCC's primary role is education and its education strategy should perform these basic roles: communicating general information, providing program-specific information, instructing about recycling procedures, etc., responding to requests for information, and promoting long-term behavioural change.

Current Status

The Task Force determined the present state of affairs at the College to compare it with other post-secondary institutions.

At present the number of existing programs that currently incorporate aspects of environmental awareness as part of their curriculum is very limited. Survey results provide several examples:

a) Nursing - environmental health and community health issues
b) Child Care Services - science and social studies topics on environment
c) Advertising Art - use of recycled paper
d) Applied Sciences - environmental sampling, natural resource management, applied microbiology
e) Entrepreneurship Training Program - social/environmental issues
f) Food Services - WHMIS
g) Business Administration - ethical business conduct, future challenges
h) Health Centre - environmental awareness information
i) Dental Assisting - WHMIS, MSDS
j) Medical Laboratory - microbiology
k) Motor Vehicle Body Repair - solvent disposal, paint aerators.

Cross-Curricular Courses

Environmental protection is not only multidisciplinary but also cross-curricular in nature. Trained environmental personnel must have:

1) knowledge, concepts, and skills in a number of scientific areas;
2) some understanding of the social policy or social science aspects of the environment;
3) a technical understanding of current environment issues affecting business.

Therefore the Task Force recommends the following:

B.1 The College should develop and incorporate sustainable development issues into all appropriate programs.

Some possibilities include:

a. an environmental literacy course, combining science and social issues
b. short courses, modules, and lectures from industry; work-study terms or internships in industry or government; independent home study programs. These could include economics, ethics, politics, ecology, basic science, etc.
c. sustainable development courses for business, applied arts, technology, trades, and health divisions similar to courses offered as part of the MBA program at Western Ontario and Queens universities, entitled "Management for Sustainable Development"
d. an "Environmental Awareness" course for graduating students offered in the 4 to 6 p.m. time slot or during one of the term breaks, and made a requirement for graduation
e. A one-year, post-graduate diploma or certificate course in environmental science
f. An "Environmental Awareness" course as part of instructor training for the Certificate in Adult Education.

New Programming

The development of new programming designed to address environmental factors must consider budgetary constraints. Industry needs and market analysis would be required prior to any new programming. This could be one task of the environmental coordinator working in conjunction with the deans.

B.2 New training programs based on environmental issues should be researched and developed.

Some possible program or occupational areas are:

a. Environmental Protection Technology
b. Environmental Auditing/Environmental Impact Assessment
c. Environmental Engineering Technology
d. Recycling Technician
e. Waste Management Technician
f. Water/Wastewater Treatment

g. Hazardous Waste Treatment
h. Energy Conservation/Alternatives
i. Waste Biotechnology
j. Toxicology and Risk Assessment
k. Environmental Regulations/Laws
l. Environmental Emergency/Procedures.

C. COMMUNITY OUTREACH

RRCC is a member of the Winnipeg community and as such must play an active role in the community. The College should ensure that its activities coincide with and aid the community on environmental issues and concerns. The local community should also make use of College expertise and facilities.

Even though environmental issues have a strong public appeal, there is a need to provide the public at large with accurate information for an understanding of sustainable development. It is important that a broad understanding of alternatives be known. Educational materials that describe specific development projects in Manitoba are essential. It is the responsibility of the College, as one of the stakeholders, to provide information to the general public. RRCC should be committed to advancing public understanding of key environmental challenges facing Winnipeg, Manitoba and Canada.

For its community outreach initiatives, the Task Force recommends the following:

C.1 The College should establish community demonstration projects.

Some possibilities are:
a. a composting centre
b. an R2000 home
c. local energy success stories
d. organic gardening
e. naturalized green space
f. a grey water reuse program.

C.2 RRCC should encourage and assist student activities that are environmentally related.

Some possibilities are:

a. environmental youth corps
b. a student conference on the environment
c. environmental clubs
d. environmental internships
e. environmentally sound products in the campus store.

C.3 RRCC should play an active role in increasing public environmental awareness.

Some possibilities are:

a. establishing sustainable development courses to be provided to external groups
b. establishing an environmental information network
c. establishing an environmental speakers' list
d. organizing a trade fair to promote efficient products and processes
e. establishing a "Green-Up" campaign to educate the community about how to implement sustainable development in the home setting
f. developing a series of information guides covering a broad range of environmental and economic topics
g. establishing a community or area storage for household and small industry hazardous wastes, upgrading College and community recycling efforts in partnership with the City of Winnipeg, and establishing a composting centre
h. initiating a highly visible naturalized green space project that includes a natural space design site (i.e. landscaping for nature)
i. encouraging the use of College facilities at cost to non-profit environment non-government organizations for meetings,lectures,conferences,demonstrations,etc.
j. creating an environmental slogan.

C.4 RRCC should support teaching of Native history, traditions and culture to promote better understanding of relationships between aboriginals and the environment.

C.5 RRCC should undertake projects with a strong public education component that allow for better articulation with the public school system.

Some examples are:

a. developing a "Partners in Education program" with schools
b. using College property to host an environmental festival
c. developing programs for secondary school students such as the Public Focus' Visions 2000 program in Ontario.

CONCLUSION

The need for environmental sustainable and equitable forms of economic development has become increasingly recognized in recent years. The College should endorse the concept of sustainable development and launch several initiatives to promote it.

The promotion of sustainable development will require a comprehensive effort. Examples of the measures which will be needed are a greater commitment to environmental science in programming, implementation of policy and economic instruments to achieve environmental objectives, environmental review of policies and programs, staff training and support, a system of incentives and rewards for managers, clear lines of accountability, the communication of sustainable development success stories and building of partnership with stakeholders. Only by adopting a broad diversity of both knowledge-based and process-based actions can the College move ahead with the implementation of sustainable development.

SOURCES OF INFORMATION

Association of Canadian Community Colleges

Assiniboine Community College

Banff Centre for Management

Canadian Council of Ministers of the Environment

Conference Board of Canada

Canadian Association for Adult Education

Canadian Manufacturers Association

Canadian Consumers Association (Manitoba Chapter)

Canadian Environmental Network

Canadian Petroleum Association

City of Winnipeg

Canadian International Development Agency

Dalhousie University

Dow Chemical

Environment Canada

Fort Whyte Centre

Freshwater Institute

Greenprint for Canada Committee

Global Environmental Management Initiative

IBM Canada

International Institute for Sustainable Development

International Chamber of Commerce

INCO

Industry Science and Technology Canada

Imperial Oil

Manitoba Environment

Manitoba Energy and Mines

Manitoba Industry, Trade and Tourism

Manitoba Hazardous Waste Corporation

Manitoba Environmental Council

Manitoba Hydro

Marquis Project

Mining Association of Manitoba

National Round Table on the Environment and the Economy

Public Forum Plan Winnipeg

Rawson Academy of Aquatic Sciences

Red Deer Community College

Sustainable Development Co-ordinating Unit

Shell Canada Ltd.

Supply and Services Canada

Science Council of Canada

Tufts University

University of Western Ontario

University of Waterloo

University of Manitoba

United Nations Environmental Program

Winnipeg Chamber of Commerce

Western Economic Diversification Canada

APPENDICES
Appendix "A"

Office of Environmental Affairs functions:

1. Develop and recommend organization policy on environmental issues.

2. Implement approved policies and maintain policy co-ordination throughout the organization.

3. Keep abreast of technical and legal developments, and legislation trends in the field of environmental protection. Evaluate this information and advise appropriate managerial personnel of the probable long- and short-term effects, together with recommended courses of actions.

4. Consult and maintain liaison with all departments of the organization to ensure effective co-ordination of environmental activities.

5. Participate on external committees at the policy-making level and co-ordinate membership of organization personnel on society and local committee and groups.

6. Participate in hearing about pollution with federal, provincial and local agencies as the organization representative or co-ordinate arrangements for other organization personnel.

7. Review environmental problems brought up by various departments and assist in the development of recommended courses of action.

Appendix "B" RRCC could promote partnerships with business and industry to help achieve a healthy environment by representation on panels, boards and committees.

Some possibilities include:

Winnipeg Chamber of Commerce - Sustainable Development Committee
Canadian Labour Congress - Environmental Committee
Canadian Manufacturers' Association - Manitoba Division
Clean Environment Commission
Winnipeg 2000
Manitoba Chamber of Commerce
Manitoba Association of Urban Municipalities
Manitoba Forestry Association
Manitoba Water Commission
Canadian Federation of Small Business
Canadian Nature Federation
Consumers Association of Canada
Boards of various corporations

Appendix "C" Proposed Short Action Plan

Objective #1:
Provide coordination, advice, and recommendations on sustainable development policy and initiatives at the College.

a) Prepare and distribute Task Force Interim Report and Recommendations to College Management Committee for discussion.

Target Date: March 199
Responsibility: Task Force
Measurement Criteria: Report completed and distributed

b) Present Interim Report with "Action Plan" to College Management Committee. Emphasize short term initiatives.

Target Date: May 19, 1992
Responsibility: Task Force Chair
Measurement Criteria: Presentation made

c) Print and disseminate copies of interim report and solicit internal and external feedback.

Target Date: June 1992
Responsibility: Task Force
Measurement Criteria: Report printed and disseminated with questionnaire for feedback.

d) Produce Final Report incorporating feedback obtained.

Target Date: October 1992
Responsibility: Task Force
Measurement Criteria: Final Report completed

Objective #2:
Identify specific resources to educate and inform personnel, increase awareness of sustainable development, and implement sustainable development practices.

a) Appoint an environmental coordinator.

Target Date: September 1992
Responsibility: College Management Committee
Measurement Criteria: Coordinator in place

b) Establish environmental advisory committee. Suggested membership to include both external and internal representatives.

Target Date: Fall 1992
Responsibility: Environmental Coordinator/College Management Committee
Measurement Criteria: Advisory committee in place

c) Draft terms of reference for environmental coordinator and environ mental advisory committee.

Target Date: Fall 1992
Responsibility: Environmental Coordinator/Advisory Committee
Measurement Criteria: Terms of reference in place

d) Discuss implementation of recommendations with staff at College inservice.

Target Date: December 1992
Responsibility: Environmental Coordinator/Staff & Program Development
Measurement Criteria: Discussions held

e) Participate in a national Water Conservation Conference. Sponsor a technical and trades training workshop at the conference in February 1993.

Target Date: February 1993
Responsibility: Environment Coordinator/Advisory Committee
Measurement Criteria: Workshop developed and conducted

f) Establish and adopt an environmental policy.

Target Date: April 1993
Responsibility: Environmental Coordinator/College Management Committee
Measurement Criteria: Policy in place

Objective #3:
Implement "greening" Programs in College procurement, operations, and disposal procedures.

a) Promote the use of environmentally-friendly beverage containers at all college committee meetings.

Target Date: Fall 1992
Responsibility: College Management Committee
Measurement Criteria: Practice in place

b) Conduct an energy audit of College facilities. Establish electricity use reduction targets and practices.

Target Date: Spring 1993
Responsibility: Environmental Coordinator/Government Services
Measurement Criteria: Energy audit completed; practice in place

c) Examine the feasibility of improving the College grounds. This could also include the establishment of demonstration projects such as composting.

Target Date: Spring 1993
Responsibility: Environmental Coordinator/Advisory Committee/Government Services
Measurement Criteria: Feasibility study completed

d) Minimize the amount of waste the College produces. Conduct a waste audit. Develop strategies which will reduce usage and waste of one specific material such as paper.

Target Date: Spring 1993
Responsibility: Environmental Coordinator/Advisory Committee
Measurement Criteria: Audit completed, conservation practices in places

FEEDBACK ! ! !

Dear Respondent:

The enclosed report of the Task Force on Sustainable Development at Red River Community College offers numerous recommendations on the tasks and activities in which RRCC can participate to improve its relationship with the environment and continue to be a responsible corporate citizen. We request your opinion on the proposed policies, activities, and direction described in this interim report.

Please mail your response to:

Mr. Andy Burzynski
Task Force Chairperson
Red River Community College
A407B-2055 Notre Dame Avenue
Winnipeg Manitoba
Canada R3H 0J9

1. The interim report propose a College "Environmental Policy" on page 5. Should this proposed policy be modified to include or exclude policy statements? (check one)

☐ NO ☐ YES If YES, what statements should be included or excluded

_____

_____

_____

2. The list of recommendations on pages 6-13 in the interim report is fairly extensive. Are there "sustainable development" activities not indicated in which RRCC should be involved?
Are there activities indicated in which RRCC should not be involved?

Involvement:

_____

_____

_____

Non-involvement:

_____

_____

_____

3. Would you, your department or your organization be interested in participating in "sustainable development" courses, seminars, or workshops offered by RRCC?

☐ NO	☐ YES	☐ OFF-CAMPUS	☐ ON-CAMPUS
	☐ Individual	☐ Course	☐ Course
	☐ Department	☐ Seminar	☐ Seminar
	☐ Organization	☐ Workshop	☐ Workshop

4. Additional information: External Respondents only!
Would your organization be interested in developing a "partnership" arrangement with RRCC for one or some of the more comprehensive proposed activities (e.g. demonstration projects; personnel exchange; technology transfer; environment trade fairs, etc.)?

☐ NO ☐ YES

Please identify a contact person in your organization
(name, position, address, telephone)

_____

_____

_____

5. Would a member of your organization be interested in participating in a sustainable development advisory or committee capacity with RRCC?

☐ NO ☐ YES ☐ SAME PERSON AS ABOVE

_____

OR

_____

_____

6. **Any other comments?**

_____

_____

_____

_____

_____

_____

Respondent's Name / Address (optional)

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION!

Education and training for sustainable development:

A MODEL FOR PROGRAM REVIEW AND DEVELOPMENT. ASSINIBOINE COMMUNITY COLLEGE - BRANDON, MANITOBA

PREPARED BY:

Mark A. Burch
Coordinator, Sustainable Development
Education Development Centre

INTRODUCTION

The transition to more environmentally-sustainable patterns of livelihood will touch every aspect of human activity in some way. This will have profound implications for education and training programs. Curricula for entirely new careers and disciplines will be needed to meet the challenges of living more harmoniously within the ecosphere. In addition, the transition to sustainability implies review and redesign of many, if not all, existing training programs.

A fruitful application of sustainable development to education and training involves a process of decision-making and valuing which guides both the creation of new programs and informs the curriculum review process as applied to existing programs.

The following pages describe some goals and evaluative criteria which can be applied to program review and development for post-secondary adult education. It is assumed that education for sustainable development aims to achieve certain goals which, in some respects, are different from, though complementary to, traditional goals for education and training—otherwise, we would already be living sustainably which is manifestly not the case.

Following a discussion of principles, some general goals are derived which can guide program review. This will involve specific applications of principles to the program design and evaluation process in the form of questions which must be addressed effectively in order for a program to contribute to sustainable development.

Finally, understanding of the goals and processes which contribute to sustainable patterns of livelihood will evolve as knowledge, technology, values and world views change. Important, therefore, is a critical openness to new goals and applications comprising the evaluation model.

PRINCIPLES OF SUSTAINABLE DEVELOPMENT FOR EDUCATION AND TRAINING

Goal

The goal of education and training for sustainable development is to enable clients to acquire the knowledge, skills and attitudes which make possible evermore sustainable patterns of livelihood. The purpose of program review and development is to identify transformations of existing programs or criteria for the design of new programs which progressively improve the capacity of these programs to meet the goal of education and training for sustainable development.

Principles, Goals and Strategies

A growing number of publications present lists of "principles of sustainable development." The most famous and often quoted of these was the Report of the World Commission on Environment and Development, Our Common Future (1987), followed by many others including the World Conservation Strategy (1990), The Canadian National Round Table on the Environment and the Economy (1989), the Summary Report: The Future Direction of Sustainable Development in the Curriculum, a report of the Preconference symposium of the 1990 World Environment, Energy and Economy Conference (1990), EE2000 Environmental Education for a Sustainable Future (1989) prepared by the Environment Council of Alberta, and Towards A Sustainable Development Strategy for Manitobans (1990) written by the Manitoba Round Table on the Environment and the Economy, virtually every provincial round table, the Canadian International Development Agency (1992), the World Bank, and numerous individual writers (Rees, 1989; Weeden, 1989; Robinson, et al., 1990; Disinger, 1991; and others).

These lists overlap but seldom correspond. As various bodies claiming authority in sustainable development vie for priority of place, lists of "principles" have proliferated. Sustainable development talk is coming to resemble a thicket of complicated jargon and proposals each of which competes with the others for attention and funding.

Principles must be distinguished from goals, strategies and objectives. Sustainable development literature freely mixes these four categories without much regard for how they are different. This kind of ambiguity obstructs meaningful application of sustainable development to education and training.

A principle is a highly abstract assertion regarding the nature of things or the desired nature of things. The Law of the Conservation of Matter and Energy is a basic principle of physics and chemistry. The principle of universality expresses the collective intention of Canadians to provide health, social and educational services on a universal basis.

The present model for program review rests on some beliefs about the nature of the ecosphere and of that part of the ecosphere which is organized around human beings and their activities. These highly generalized beliefs might be called "principles" of sustainable development, although some of them are philosophical hypotheses and others are assertions of value. Sustainable development names the hypothesis that human development activities designed in light of these principles can be harmonized indefinitely with the laws and limits of the ecosphere.

A goal is an aim, purpose or standard logically related to a principle which guides activity and program development. A specific series of actions intended to achieve a goal constitute a strategy while strategic steps described in terms of observable performance constitute objectives.

For example, a national health care service may be a goal derived from the principle of universality while establishing a network of hospitals and clinics may form one strategy in service of the goal. Running preventive health education courses or treating a specific number of patients from identified groups may be objectives of a given strategy.

With these distinctions in mind, the multitude of proposed "principles" of sustainable development can be viewed as examples, applications, goals or objectives which grow from only four propositions general enough to be called "principles."

The Principle of Holism

Holism refers to the ecological insight that the ecosphere and all of its living systems arise and subsist as wholes. Wholeness is a defining characteristic of living systems. While living systems are analyzable in discus-

sion and we can attempt linear descriptions of these systems in language, the reality of living systems is that they are non-linear and un-analyzable. Action plans based on linear, analytical approaches to the ecosphere are unsustainable.

Definitions of sustainable development which are limited to "integration of environment and economy" acknowledge the integral relationship between economic activities and environment but suggest a misleading boundary between this domain and all other human activities. Education for sustainable development must embrace the principle of holism in a much broader sense. All development - social, cultural, artistic and spiritual, as well as technical and economic - occurs within and can have an effect upon the ecosphere.

The Principle of Interdependence

Interdependence expresses the nature of the relationships between the living systems of the ecosphere, that is, of systems organized as a hierarchy of wholes. Interdependence includes such concepts as equilibrium relations, co-determination, circular causation and shared fate.

While it may be intellectually and linguistically necessary to break up the natural interdependent unity of whole systems in order to study them and discuss them, education for sustainable development must continually re-emphasize the relations of interdependence which exist in the world, apart from our talk about it. It would also be appropriate to create intellectual and methodological tools for holistic thinking as a complement to analytical thinking.

The Principle of Stewardship

The principle of stewardship is the ecological "ethic" which follows from holism and interdependence. Since our fates as human beings, the fate of our culture and our collective destiny are bound up with the destiny of the entire living system, any world view or "development" paradigm which jeopardizes the ecosphere is essentially suicidal. Long-term self-interest, intergenerational interest and the interests of the ecosphere as a whole coincide.

Since the ecosphere has clearly organized itself for long-term self-re-creation (autopoiesis), short-term thinking and the pursuit of short-term

interests are as inherently contradictory of the nature of the ecosphere as our habit of thinking in bits rather than wholes. The challenge of stewardship is not to manage the ecosphere, but to learn to manage human behaviour within it so as to realize our potentials without destroying the living vehicle that carries us within itself. Stewardship implies conservation, intensive rather than extensive development, rehabilitation of damaged ecosystems, minimum impact technologies and personal lifestyles of greater material simplicity.

The Principle of Participation

The principle of participation is the social/political corollary of holism and interdependence. Since we are all connected to each other by virtue of the nature of the living system we inhabit, participation is a given. Recognizing participation as a key principle of sustainable development is merely to relinquish the delusion that the interests of some members (groups, species, etc.) can be advanced at the expense of others. Participation implies working for an optimization of outcomes rather than a maximization of outputs or profits.

Education and training for sustainable development thus entails education for responsible, informed, effective and creative participation in the life of the whole. Just as an athlete cannot develop the whole body by working on just one arm, so the interests of living systems and human beings cannot be advanced by reference to the ideas and goals of only one group or one species.

The principle of participation also implies that action for sustainable development is inherently a shared responsibility to be lived out at the personal, household, community, national and international levels at the same time.

Other Aspects

In addition to the concepts fundamental to education and training for sustainable livelihood, there are several other aspects of sustainable development which deserve mention.

Focus on human needs . Much current writing on sustainable development pertains to meeting human needs, meeting the basic subsistence needs of developing nations through traditional but more ecologically

appropriate forms of economic activity, meeting the aspirations of citizens of industrialized countries through more efficient and less resource/energy intensive economic activities, and so on.

In most such discussions it is assumed that the ecosphere exists and functions for the sake of meeting human needs, that human survival takes precedence over the survival of any other species, and that the positioning of more "biocentric" values would be morally regressive. This debate is ongoing. Furthermore, the moral question whether some people can use resources and energy to realize aspirations of luxury while other people still lack basic necessities is also an ongoing issue. Direct attention to this issue would form a logical and necessary part of education and training for sustainable development.

Meanings of "environment" . Another issue in sustainable development talk is the meaning of "environment." In some quarters, a Cartesian view of environment is still maintained in which dead matter and spatial extent form the background and provide the resources for human activities which themselves command foreground attention.

In other views, environment has a more comprehensive meaning, including both natural and built environments, living systems, geophysical processes as well as the peculiar conditions which obtain within the massive systems of interventions imposed by human beings (e.g. urban centres, managed forests, agriculture). It is hard to imagine an educationally meaningful concept of sustainable development which did not adopt this broader perspective of environment.

Limits . The earth is clearly a limited and finite system. Its energy budget is limited to the incident solar flux plus its stored fossil energy. There are also inherent limits imposed by the laws of physics and chemistry, the nature of cell physiology, the efficiency of photosynthesis, the capacity of the ecosphere to absorb wastes, toxins and degraded energy. All of these factors represent absolute constraints within which the human story must be written (Rees, 1989).

Practical limits on human populations and human activities, however, are a more complicated and indeterminate matter. Such practical limits are a joint function at least of population size, level and type of technical development, the carrying capacity of local environments, valuing of material acquisition as a measure of wealth, status, reward, and a region's degree of dependence upon "imported ecological carrying capaci-

ty." While the laws of thermodynamics set the absolute limits on human activities, our choices and values set the practical limits in local situations.

Sustainable development as process rather than credo . Our understanding of the principles described above will change. Better science will reveal more about the nature of the interdependent system we inhabit. We hope that advances in technology will allow more efficient use of resources at the same time as the accumulating effects of past environmental abuses impact human life more and more severely. Perhaps changes in cultural values and spiritual intuitions will entirely reorient the human relationship to the ecosphere. Sustainable development can therefore never be a credo of timeless pronouncements, but rather a commitment to an on-going process of learning and change. Sustainable development is inherently educational.

Education and training for sustainable development cannot consist primarily of specific information about the environment, or economics, or even philosophy. Especially it cannot mean memorizing any list of specific strategies.

Rather, the meaning of sustainable development should emerge from a process wherein educators confront the reasons why sustainable development is an urgent human concern and, in confronting those reasons, fashion responses based on the best science, the best communication and social organization skills, and the most incisive spiritual intuitions available to us. Education and training for sustainable development will then be inherently exploratory, problem-focused, iterative, holistic, relational and evolving.

Let us now move from principles to the goals and strategies which might be found in education and training programs which support sustainable development. There are at least two aspects of the post-secondary training system to which the principles of sustainable development can be applied.

The first of these concerns is the operation of physical plant and institutional facilities. As demonstrated in the preceding article outlining the process undertaken by Red River Community College, expertise needed for this kind of evaluation is already well developed and does not form

the subject of this model. It is assumed, however, that an energy and resource audit of institutional physical plant operations would form an essential part of any plan to move an institution toward greater sustainability.

The second aspect of the post-secondary education and training system concerns the content and methodology of courses and programs. The goals summarized below are paraphrases of "principles," "strategic objectives," "guidelines," etc., drawn from a number of the sources cited above which attempt to express the sense of their application to education and training programs.
Goals for this process have been organized into three groups:

(1) economic/technological goals;
(2) environmental/conservation goals;
(3) social/cultural goals.

This grouping attempts to reflect the emerging consensus that sustainable development decision-making requires inclusion of at least three dimensions: economic, social and environmental (Sadler, 1987). Some goals "overlap" and could be placed in more than one group. Not all will have equal relevance to a particular course or program curriculum. None purport to be "behavioural objectives" which subsist at a more detailed level of curriculum design.

Economic/Technological Goals

Education and training programs for sustainable development should:

- stress stewardship and conservation of natural resources and biosphere processes;
- reorient technological and scientific innovation to harmonize with the principles of sustainable development;
- integrate environmental, economic and social development values in all aspects of program planning and decision-making;
- change the quality of "growth" so as to reduce demand for resources and energy while improving quality of life;
- focus on meeting essential needs of human beings for jobs, food, energy, water and sanitation. And, it shall be the nature of human beings, not

marketing techniques, which defines what is a "need."

Environmental/Conservation Goals

Programs and courses which enable sustainable development should:

- stress effective management of human behaviour in relation to energy and natural resources through stabilization and reduction of demand and conservation of sources;
- stress the importance of attaining sustainable levels of human populations;
- encourage clients to rehabilitate and reclaim damaged environments, and especially to anticipate and prevent environmental degradation which might result from their behaviour;
- stress effective management of wastes and risks;
- conserve biodiversity and promote resilience in natural systems;
- accord special attention to human/environment interactions from a multi-disciplinary perspective where appropriate.

Social/Cultural Goals

Education and training programs which enable sustainable development should:

- encourage attitudes and behaviours which support sustainable patterns of livelihood;
- include, wherever appropriate, a global perspective of the role and relevance of the field or occupation for which the client is preparing;
- empower local communities/individuals and adopt a bio-regional approach to development;
- emphasize shared responsibility, participative decision-making and cooperation in meeting environmental, development and social challenges;
- aim for an equitable distribution of the benefits and costs of resource use and environmental management within and between countries;
- identify or develop means to meet human needs which are appropriate

to the need, e.g. it is inappropriate to use material means to try to fulfill essentially non-material human needs.

CRITERIA FOR EVALUATION OF SUSTAINABLE DEVELOPMENT/PROGRAM INTEGRATION

Based on these general goals, a number of questions can be posed with respect to any existing course, program or proposal. Not all questions would be applicable to the same degree to every program. It is assumed, however, that when existing courses or training programs come under review, certain questions must be answered regarding the currency and relevance of their content, method, learning activities, etc. Similar questions must be answered as proposals for new programs are considered and developed.

The criteria suggested below are not intended to replace many other criteria which also deserve to be on the table during program review, e.g., use of inclusive language, freedom from ethnic and racial biases, consistency with the state of knowledge regarding the accepted principles of good adult education, etc. Sustainable development criteria are, however, intended to complement and round out traditional concern for quality programming.

Another consideration concerns the dual nature of the education and training enterprise. Education prepares people to act, think and value in certain ways after training is completed, but education is itself a manner of acting, thinking and valuing. This implies that we must be concerned with the content and process of programs both from the perspective of what they prepare people to do later and also from the perspective of the very activities the training experience entails. Therefore, **concern with sustainable development in education has at least as much to do with the way our own educational institutions are managed and operated as it does with what we teach.** Both dimensions must be present in evaluating programs relative to sustainable development.

Listed below are questions which require both information about and judgments to be made upon courses, programs and operations. It is assumed that such questions would be revised as the state of knowledge changes and that they would be asked over and over again. Effective education for sustainable livelihood is not a state which can be achieved once and for all but rather a goal which can only be approached. For consistency, questions have been grouped according to the three groups of goals cited above.

Economic/Technological Criteria

1. What steps have been taken to select products, resources, materials and equipment for the training program which minimize environmental impact, i.e., minimize demand for materials, energy, waste, toxic substances, etc.?

2. How does the curriculum for the proposed or existing program address environmental stewardship and intergenerational responsibility as these relate to the occupation for which the client is being prepared?

3. Describe how the curriculum encourages clients to reorient their role in technical, scientific and social innovation so as to harmonize with the principles of sustainable development.

4. How does the curriculum for the proposed or existing program integrate environmental, economic and social considerations in all aspects of planning and decision-making as these would be exercised by clients both during and after their training?

5. List the ways in which the proposed or existing program distinguishes quantitative growth from qualitative development and helps clients understand the relation of these to resource use, energy demand and economic activity.

6. Identify those aspects of the proposed or existing program which explain how environmental and social sustainability depend upon a sound economy.

7. If appropriate, how does the program curriculum point out the need for environmentally benign economic development, growth of innovations which conserve energy and resources and technical development which has minimal or positive effects on the ecosphere?

Environmental/Conservation Criteria

1. What measures are taken in the proposed or existing program to optimize the use of local resources, recycled resources and/or resources which can be obtained on a sustained yield basis?

2. Describe how the proposed or existing program reduces the use of, and trains clients to reduce the use of, exotic, hazardous or imported

materials which substantially affect the quality of life for people in other parts of the world.

3. Summarize the environmental impact assessment performed for the program under review, if appropriate.

4. How does the program curriculum address the environmental implications and consequences of the occupation or profession for which clients are being trained?

5. List objectives which sensitize clients to the opportunities for, and enable them to, reclaim and rehabilitate environments previously degraded by human activity insofar as the client may have responsibility and latitude to do so.

6. Describe how the curriculum addresses the wastes and risks associated with the occupation or profession for which the client is being prepared, and which enable clients to manage their behaviour so as to minimize waste and risk to themselves, to others and to the ecosphere.

7. If appropriate to this program, identify objectives pertaining to the relation between the occupation or profession for which the client is being prepared and maintenance of bio-diversity.

8. Explain how the proposed or existing program illustrates how economic and social sustainability depend upon an intact ecosphere.

Social/Cultural Criteria

1. How does the curriculum for the proposed or existing program help clients situate their training and future occupation in a global context?

2. Identify and describe the concepts, methods and activities which support an holistic learning process, i.e., addressing the emotional, physical, sensory, imaginative and intuitive dimensions of human experience in this occupation as well as its cognitive aspects.

3. Name aspects of the proposed or existing program which sensitize clients to, and enable them to avoid, the foreclosure of options, intergenerational inequity, etc. in the pursuit of their future occupation.

4. How does the proposed or existing program curriculum strengthen the role of individuals and communities in the promotion and practice of local/regional development?

5. Describe how the program content and delivery methods fit the bioregional context within which the program is offered, i.e. how do they harmonize with the ecosphere, culture and social history of the region so as to help clients develop a sense of "presence" during training and in the pursuit of their occupations?

6. Identify the steps taken to assure that curriculum and program development occurred in an open, participative and inclusive manner so that all parties affected by, as well as in a position to benefit from, the program were involved in its creation or review.

7. What measures have been taken to assure that access to the proposed or existing program is equitable?

8. List the needs the proposed or existing program is intended to meet and the ways in which the program meets them.

9. Summarize the ways in which this program enables clients to understand how responsibilities for sustainable development are shared among all those involved in the occupation for which the client is being trained.

10. Explain how the proposed or existing program shows how social sustainability depends upon a sound economy within an intact and healthy ecosphere.

APPLICATION

The criteria listed above could be applied in two ways:

a) as evaluative criteria applied to existing courses, programs or services such that additional goals, objectives and content could be included which supports progress towards sustainability;

b) as design requirements set for new programs, courses or services intended to contribute to sustainable development.

Several good models already exist for the design of education and training programs for adult learners. It is not our purpose to repeat the exercise here. It is suffice that virtually all extant models begin from criteria, goals or broad general objectives which guide the selection of content, methods and expectation of outcomes. It is suggested that curricula now be "measured" against the criteria of sustainability described above.

One approach to this task could be made through the construction of some evaluation guidelines to assist with program review. Ideally, the information generated from such an instrument should provide useful, specific direction regarding changes, deletions, additions or modifications of a program to increase the contribution that program makes toward the goal of education and training for sustainable livelihood. A draft of such an instrument has been constructed below.

In their present form, the guidelines would be used by curriculum designers and program reviewers to focus attention on elements of content and method which ought to be included to meet the goals identified with sustainable development. It is assumed that these guidelines will undergo expansion and revision in the future.

Education and training program evaluation guide for sustainable development

Rev. 3/92

COURSE/PROGRAM OPERATIONS:

PLANNING: 1. Describe how this program has been (will be) developed:

Identify what steps have been taken to assure an open, participative and inclusive planning process so that parties affected by, as well as in a position to benefit from, the program have been represented in its creation or review.

2. Describe how economic, environmental and social considerations have been integrated in the major decisions affecting the planning/operation of this program.

3. What human needs is this program/proposed program intended to meet? Assure that a statement of intended needs is included in the rationale for the program.

4. List those measures which have been taken to optimize use of local resources and fit this program/proposed program within its bioregional context.

RESOURCE USE:

1. Identify the products, supplies, materials and equipment used in this program/proposed program.

Within the budget provided for this program/proposed program, what steps have been taken to select products, supplies, materials and equipment so as to minimize environmental impact, waste generation, toxicity, etc?

2. Describe how energy is used in this course/program.

Review the steps which have been taken to (a) minimize energy demand, (b) minimize energy waste, (c) maximize the use of renewable energy sources, within the budget and training requirements of the program.

3. How does this program/proposed program attempt to maximize the use of local resources, recycled resources and/or resources which can be obtained on a sustained yield basis?

4. Show how the selection of all equipment and materials used in this program/proposed program have been based on life-cycle costs.

5. Identify any hazardous, exotic or imported materials required for this program/proposed program.

Describe what measures have been taken to minimize the use of such materials, especially when their procural or manufacture negatively affects the quality of life for people in other regions.

IMPACTS:

1. What economic, environment and social effects result from the operation of this program/ proposed program?

Describe what measures have been included in this program/course for the reclamation, rehabilitation or amelioration of whatever negative impacts may be caused by this program.

2. Identify how this program/proposed program minimizes wastes and assures the proper reuse, recycling and/or disposal of wastes.

3. What risks are associated with this program/proposal to human health or safety and what risks, if any, pertain to other species or habitats?

What steps have been planned to minimize risks and anticipate their consequences?

4. Describe what steps have been taken to assure that access to this program is equitable.

COURSE/PROGRAM CURRICULUM:

1. List objectives which enable clients to identify products, resources, materials and equipment which minimize environmental impact and energy demand within the career functions for which they are being trained.

2. Describe objectives of the program (proposal) which address environmental and resource stewardship as these relate to the content of the program.

3. Identify the content and methods included in the curriculum which familiarize clients with the principles of sustainable development.

How will clients in this program/proposed program learn to harmonize their role in technical, scientific and social innovation with the principles of sustainable development?

4. Name the ways in which graduates from this program/proposed program may be involved in decision-making either during education and training or in their future career roles.

Identify objectives which enable clients to approach decision-making and planning in terms of the integration of economic, environmental and social values and issues.

5. Describe how this program/proposed program will enable clients to distinguish between quantitative growth and qualitative development as these apply to the subject/skill area concerned.

Name the objectives which address the relation between growth, development, resource and energy use, economic activity and social well-being.

6. List objectives which help clients identify opportunities to use local resources, recycled resources, and/or resources available on a renewable basis in the functions for which they are being trained.

7. Cite objectives which address hazardous, exotic or imported materials and processes in the workplace and which will enable clients to handle them in an environmentally and socially responsible manner.

8. Identify objectives included in the program/proposed program which sensitize clients to the opportunities for, and enable them to, reclaim and rehabilitate previously degraded environments as appropriate to

the occupation or profession for which clients are being prepared.

9. Name the objectives included in the curriculum which help clients develop skills to anticipate and prevent environmental, social and economic damage from their activities.

10. List objectives included in the program which address the risks associated with, and the skills needed, to handle wastes generated in this occupation.

11. If appropriate, what objectives have been included which address the relation between the occupation/career for which the client is being trained and the maintenance of biological diversity?

12. Describe how the program helps clients situate their future activity in a global context.

13. Explain how the design of learning activities includes affective, sensory, intuitive and behavioural objectives as well as cognitive learning goals, whenever appropriate.

14. List objectives which enable clients to identify activities in the exercise of the occupation or career for which they are being trained which contribute to inequities or foreclose future development options for people elsewhere in the world or for future generations.

15. If appropriate, describe objectives which enable clients to participate effectively in localized and regionalized approaches to development.

16. Explain how the program/proposed program enables clients to identify and prioritize human needs, distinguish needs from wants, desires and aspirations, and identify how their future career activities contribute to meeting needs.

17. Name the objectives in the program/proposed program which equip clients with the skills to participate in (or facilitate and enable) participative styles of decision-making and planning as appropriate to their career or future occupational role.

18. Cite objectives which enable clients to recognize and understand how responsibility for sustainable development is shared among the practitioners of his or her future career.

19. If appropriate, name objectives or program elements which enable clients to consider and harmonize their career activities with the local bioregion, i.e., the ecosphere, the cultural and social history of the region in which the client lives and works, etc.

20. Describe the objectives or features of the curriculum which address and communicate the values consistent with sustainable development, e.g., holistic perspective, equity, stewardship, participation, respect, integrated decision-making, ecological awareness, etc.

REVIEWERS This program evaluation model has been referred to the following individuals and organizations for review and comment:

Ruth Watson,
Environmental Citizenship Project, Environment Canada, Ottawa.

Jack McLeod,
Chair, Education Sub-Committee, National Round table on the Environment and the Economy, Ottawa.

Dr. Arthur Hansen,
President, International Institute for Sustainable Development, Winnipeg, and three other professional staff of IISD.

Darwin Donechuk,
Education Working Group, Sustainable Development Coordination Unit, Executive Council, Government of Manitoba, Winnipeg.

Terry-Anne Boyles,
Director of National Services, Association of Canadian Community Colleges, Ottawa.

Gerry Brown,
Chair, Association of Canadian Community Colleges Environment Task Group, Ste. Anne de Bellevue, Quebec.

Dr. Brian Desbiens,
President, Sir Sandford Fleming College, Lindsay, Ontario.

Peregrine Woode,
Coordinator, Project Learning, Foundation for International Training, Don Mills, Ontario.

Jill Stalker,
Environmental Studies, Sir Sandford Fleming College, Lindsay, Ontario.

Allen MacPherson,
Coordinator, Parks and Forest Recreation Program, Sir Sandford Fleming College, Lindsay, Ontario.

John Buck,
Dean, Faculty of Natural Resource Management, Sir Sanford Fleming College, Lindsay, Ontario

Alison Elliott,
Regional Coordinator, Endangered Spaces, World Wide Fund for Nature, Winnipeg.

Gary Lean,
Sir Sandford Fleming College, Lindsay, Ontario (Permaculture Network).

Rob Holland,
Engineering Technology and Trades Division, Assiniboine Community College,

Brandon, Manitoba.

Bonnie Bachorcik-Proven,
Coordinator, Distance Education and Agricultural Programs, Assiniboine Community College, Brandon, Manitoba.

Hal Pallister,
Chair, Assiniboine Community College Program Review Task Force, Education Development Centre, Assiniboine Community College, Brandon, Manitoba.

REFERENCES

Canadian International Development Agency,
CIDA's Policy for Environmental Sustainability.
January 1992.

Chisman, Dennis; Holbrook, Jack; Devar, Celes.
Summary Report: The Future Direction of Sustainable Development in Curriculum.
World '90 Preconference:
Winnipeg, Manitoba, Canada, 1990.

Disinger, John F.
Environmental education and sustainable development?
Journal of Environmental Education,
1990.

Environmental Education Advisory Committee to the Environment Council of Alberta. EE2000:
Environmental Education for a Sustainable Future.
Edmonton, Alberta:
Environment Council of Alberta, 1989.

Holtz, Susan. "Policicies and Processes Necessary to Achieve Sustainable Development." Published in conference proceedings of:
Environment and Economy: Partners for the Future, 1989.

Manitoba Round Table on the Environment and Economy,
Towards a Sustainable Development Strategy for Manitobans.
Winnipeg, Manitoba: Manitoba Round Table on the Environment and Economy, 1990.

National Round Table on the Environment and the Economy,
A Report to Canadians: June, 1989-1990. National Round Table on the Environment and the Economy:
Ottawa, Canada, 1990.

Rees, William E., Sustainable development: Myths and realities.
Published in conference proceedings of: *Environment and Economy: Partners for the Future.* 1989.

Robinson, Francis, Legge and Lerner, "Defining a sustainable society." *Alternatives*, 1990, *17(2)*.

Sadler, Barry Organizing for sustainability: Management systems and skills in support of environment-economy integration. Published in conference proceedings of: *Environment and Economy: Partners for the Future*, 1987.

Weeden, R. B. "Sustainable development." *Alternatives*. March/April,1989

World Commission on Environment and Development. *Our Common Future*. New York: Oxford University Press, 1987.

World Conservation Union (IUCN) et. al. *Caring For The World: A Strategy For Sustainability (2nd Draft). World Conservation Union: Gland, Switzerland, 1990.*

CHAPTER 3

THE CASE STUDIES

The environmental issues course

SIR SANDFORD FLEMING COLLEGE SCHOOL OF NATURAL RESOURCES - LINDSAY, ONTARIO

PREPARED BY

Margaret Moran, Professor,
Environmental Issues

and Brian McFadzen,
Coordinator of General Education

INTRODUCTION

The School of Natural Resources currently has an enrolment of about 1,300 students, primarily in two- and three-year programs, as follows:

- Aquaculture
- Cartography
- Environmental Pest Management
- Fish & Wildlife
- Forestry
- Geographical Information Systems
- Geology
- Heavy Equipment
- Natural Resources Law Enforcement
- Parks & Forest Recreation
- Resources Drilling
- Terrain & Water Resources

These programs deal mainly with technical aspects of natural resources. All students take a course in Ecology and Environmental Science in the common first semester.

COURSE HISTORY

Over the years, the School of Natural Resources has been concerned with the ethical and political/public policy aspects of natural resources, but usually only as discussion topics within technical or General Studies courses, and via special events such as Perspectives on Natural Resources (a symposium series hosted by the College that dealt, in turn, with energy, land, water and the Arctic).

By the late 1980s however, there was a growing concern that the curriculum did not sufficiently deal with the non-technical aspects of

resource/environmental questions - questions which College graduates and the program advisory committee indicated they were often confronted with in employment settings. The constraints of limiting budgets and allowable classroom hours made introducing one more curriculum requirement for every student most difficult; when total classroom hours were actually reduced, it became an impossibility.

From the beginning, the School of Natural Resources has always provided a strong general education component: Communications, Math, Science, Humanities and Social Sciences. The latter were offered through a "General Studies Elective," with students choosing one from a number of one-semester courses in the following fields: Anthropology, English Literature, Philosophy, Social History, Economics, Politics, Sociology, etc. In 1987, Environmental Ethics was added to the General Studies array and out of that seed grew the future Environmental Issues course.

Margaret Moran recalls:

> "When I began teaching my new course, Environmental Ethics, in September of 1987, I did not realize that I was, in essence, about to embark on a two-year pilot [course] for what would evolve into Environmental Issues.
>
> "I was hired a year earlier to teach, as part of my assignment, a Philosophy course. During that year, I noticed that students became more animated about any ethical dilemma associated with nature than about any other topic. Forestry students voiced their fears about being asked to perform tasks, in their future professional lives, that they knew to be harmful to nature. Students studying Fish and Wildlife worried about the growing influence of the extreme animal rights movement as a form of misdirected environmentalism. Indeed, people in all programs expressed alarm about the human impact on the environment.
>
> "I decided that it would be useful to have a course that could remind our students that people in other generations had thought hard about where humans belonged in the natural scheme. A related goal was to talk about ways of resolving conflicts. Since the great message of the environmental movement was that science and ethics had to be brought back together again, I felt it crucial for the course to discuss right and wrong, duty and obligation. Fearing that to so radically change a course after only one year might not be a welcome sugges-

> tion, I was delighted by the encouragement of the then General Studies Coordinator, Lawrence Gulston, and the Divisional Chair, John Buck. Somehow they even found money for supporting books, pamphlets and films for the library."

In the fall of 1989, the decision was made to try and more directly link the notion of Humanities education to the natural resource/environmental themes at the School, with this new course supplanting the existing general studies. The faculty members then teaching the various "General Studies" met to examine how this objective might be accomplished, while still maintaining some of the School's Humanities tradition.1

Quite naturally there was some reluctance to abandon existing courses (some of quite long standing) that reflected professional specialities. At the same time, there were positive considerations, the most significant being the delivery of a topical and valuable (from a societal perspective) one-semester course (three hours per week) to all second-year students.

The first incarnation of Environmental Issues, in January 1990, divided the course into five major sections: species, population, pollution, energy, and resources. Natural resources was ambitiously tackled from a variety of perspectives: historical, anthropological, cultural, ethical, political, economic. Teaching faculty shared expertise, professional viewpoints and individual course research to create a common core curriculum from which they could, through emphasis, speak to the interests of each specific program. For example, Heavy Equipment classes are most engaged by energy issues; whereas Forestry specialists respond most strongly to resource and pollution problems.

At this writing, the course has been taught for three years, and faculty are still quite comfortable with the basic aim and objectives established back in the summer of 1989:

Aim:
The student will gain expanded awareness of the human aspects of environmental questions, building upon general interest and varyinglevels of program-based knowledge.

Objectives:
The student will be encouraged:

1. to develop a balanced critical perspective on environmental issues;

2. to develop an understanding of the complexity of such issues and the range of interest/viewpoints associated with each;
3. to develop an understanding of environmental decision-making (processes and implications) at all levels, individual to global;
4. to extend communication skills (build upon first year communications courses via projects - literature research, papers, seminars, debate, discussion, etc.).

BARRIERS

1. **Lack of Suitable Text:**
Although "environmental" texts abound, those dealing with the human dimension are rare, and, like People, Penguins and Plastic Trees: Basic Issues in Environmental Ethics (Wadsworth, 1986), are too specialised for the needs of this course. They presuppose a background of philosophy, economics and/or politics. In some respects, the dearth of textbooks creates a liberating challenge, promoting innovation and increasing the use of current material. On the other hand, the sheer volume of the latter, generated by the media andscholars, soon becomes unwieldy and subject to such change as to become a problem on its own.

2 **Faculty Qualifications/Background:**
Faculty are unlikely to have formal training in the specific subject matter of this course. (Although M.A. programs in Environmental Ethics are available in some institutions, such as the University of North Texas, graduates with such specialized training are few.) But the experience at the School of Natural Resources suggests that faculty from a variety of related disciplines can readily adapt to the course, even find it enlightening and rewarding. By way of obvious caution, faculty teaching such a course need to avoid the extreme of either zealotry or denial in their personal responses to the environmental crisis.

3. **Prior Learning and Attitudes:**
Students come to the course with a wide range of predispositions and intellectual backgrounds that readily colour their responses to the topics of Environmental Issues. While this may be common to all teaching situations, in this instance these responses can certainly be intensely emotional and over-confident.

4. **Administrative Hurdles:**
The value of the subject matter in a course like Environmental Issues

is readily and widely acknowledged; however, the requisite money, energy, and scheduling time may not be forthcoming - leaving asidethe problem of overcoming professional and disciplinary overprotectiveness.

TEACHING TECHNIQUES

1. **Seminars and Term Papers**

2. **Structured Debates**

3. **Discussion Generated by Film, Article, Case Study, Hypothetical Situation:**
The course material is so topical, emotional, and controversial that faculty usually have no difficulty generating lively discussion. If a class needed to be provoked into a consideration of situations where the non-human would be given preference over the human in the case of a species conflict, the following type of leading question like this: If you were in a life boat with room for only one other creature, would you save Hitler or a wombat?

   Almost invariably, the conversation will then come around to the qualities that set humans apart from the rest of nature, qualities that society has used to justify the privileging of personal interest. Aside from obvious characteristics such as higher abilities in rationality and communications, students have made wonderful suggestions including the capacity to tell lies, to laugh, to play sophisticated games or to imagine a future. Individuals always notice that certain of these qualities can be found in some degree in animals. The class can then identify a central concept of environmentalism: that the chasm between humans and the rest of nature cannot, ever since Darwin, be assumed to be as vast as once supposed.

4. **Analogy:**
An area that presents a challenge to North American students concerns the unequal distribution of global resources. One technique to aid the imagination is to allow a bag of cookies (employ a multi-course meal if your budget allows - this College's doesn't) to stand for all the earth's resources. In a class of 20, two students (selected by draw to reflect chance rather than merit), representing 10% of the global population, get 60% of the cookies. Four others (also selected by draw) receive two cookies each. The rest have to divide the remaining cookies. The

inequity is obvious and memorable. As a bonus, this exercise leads quite naturally into a discussion of whether the Dare's Rain Forest Cookie is a marketing ploy or a serious attempt to encourage ecological diversity.

On first reading, this exercise may seem too simple for an audience at the post-secondary level, but it effectively gets across the difficult truth for students in this affluent country that the earth cannot provide sufficient resources for all five billion of its inhabitants to achieve a standard of living like Canada's.

5. **Media Analysis Assignments:**
The course has had success with a number of variations on this theme: following an issue in the media; comparing media coverage; comparing specialized magazines; examining environmental content in popular songs, movies, literature, art, humour (e.g. political cartoons). The analysis of the treatment of nature in advertisements has had particular impact on students.

6. **Environmental Interest/Pressure Group Case Study Assignments:**
Here we attempt to demonstrate the range of interests, from bird-watchers to bombthrowers, non-governmental organizations to multinationals, and lobbyists to volunteers.

7. **Guest Speakers**

8. **Glossary of Terms/Concepts**

THE FUTURE

Every year Sir Sandford Fleming students become more informed about environmental/resource/ ecology questions for a number of reasons: the increased emphasis on this material in public and secondary schools, the sustained media treatment, and the increased emphasis in our own common first semester.

As a result of all this exposure (or overexposure) to both popular and technical environmental information, the Environmental Issues course will have to assume a greater level of prior knowledge/awareness and stretch beyond it - primarily through specialization. Such would logically be associated with the students technical program, though faculty should not lose sight of the fact that they are educating individuals and citizens

as much as technicians and technologists. Some of this specialization could span all programs, as in the case of a focus on environmental issues as they impact on the First Nations.

There are indications that fatigue, even despair, may be setting in — particularly among the more idealistic students — when it comes to the state of the environment generally. Course faculty have recently been asking ourselves how they can respond to this repercussion of the Environmental Issues course, and if they should be contemplating workshops or motivational exercises to help students cope with the stresses they face, both in their current studies and future careers.

From the community perspective, the future promises an even more significant role for the School of Natural Resources (and comparable institutions) in helping the public come to terms with the confusing and conflicting environmental picture. The vehicle may well be some variation on our current post-secondary Environmental Issues course.

This case study is offered with the hope that other institutions will recognize the merit in adopting such an Environmental Issues course, but these efforts will be rewarded if people can find any ideas here that they can apply to their own circumstances.

Advocating for the environment:

THE RENEWABLE RESOURCES TECHNOLOGY PROGRAM (RRTP)

AT THE THEBACHA CAMPUS OF ARCTIC COLLEGE FORT SMITH, NORTHWEST TERRITORIES

PREPARED BY

Jack Van Camp
Chairperson of the RRTP

INTRODUCTION

Arctic College is a decentralized college system with a small headquarters, six campuses and over 30 community learning centres located throughout an area of 3.4 million square kilometres. The College delivers a variety of full- and part-time programs to adult learners. Students, on average, are older than most Canadian college students and over half of Arctic College's students are aboriginal people.

Programs are directed specifically to the northern environment to meet the needs of individual northerners, the northern workforce and northern communities. The College recognizes the need to make appropriate educational opportunities available to any adult who wishes to learn. Arctic College strives to encourage life long learning in a rapidly changing world.

The Thebacha Campus of Arctic College, the largest and oldest campus in the system is located in Fort Smith, which is just north of the northeastern border with Alberta. Campus offerings include: two-year diploma programs; apprenticeship and pre-employment trades training; and a variety of certificate programming in secretarial arts, community school counselling, interpreter/translator training, and continuing education.

THE RENEWABLE RESOURCES TECHNOLOGY PROGRAM

The Renewable Resources Technology Program (RRTP) was designed to train northerners to meet the workforce requirements of the public and private sectors for entry level technicians. The program's curriculum is slightly more than 2,000 contact hours, which are roughly divided along the following lines:

- approximately 40% of the program focuses on the development of transferable technical skills like photography, math, mapping and drafting, firearms training, etc.
- approximately 20% of the program focuses on foundation concepts of human ecology, anthropology, environmental management, enviromental chemistry, etc.
- approximately 10% of the curriculum focuses in each of four resource management disciplines: forestry, wildlife, water resources and parks.

RRTP alumni are generalist technicians with qualifications and skills which allow them entry to career paths in a wide variety of renewable resource and environmental management fields. The principle of ecological theory followed predicts that opportunistic generalists will be the most successful competitors in small, unstable and widely dispersed niches (a close approximation of the northern job market).

RRTP is an innovative program created by Dan Langille, the former Chairperson of the RRTP and recipient of the 1986 ACCC Teaching Innovations Award. The program includes the following characteristics:

1. **Northern Content:**
   The program is designed to meet the needs of the people of the North. Northern examples, specimens, situations and experience receive emphasis throughout the program.

2. **Outdoor Orientation:**
   The program is laboratory and field oriented. Approximately 25% of the program is delivered in three field camps. A guideline of 40% of course content delivery in lab or field settings is used for campus-based courses.

3. **Employment Directed:**
   The program is designed to develop the skills required by employers. An active advisory board comprised of senior representatives of the major employing agencies provides continuing direction, evaluation and support.

4 .**Block Timetabling:**
   Courses are scheduled in blocks of time ranging from three to 25 days. Two courses are generally offered each day to each class. This system provides flexibility in rationing field seasons and allows access to

expert instructional assistance from individuals in government, industry and academia who can normally be available for short terms but not for full semesters.

An integrated environmental management approach is used which addresses issues on a broad range of environmental fronts. The spectrum runs from environmental protection to environmental control, to resource conservation and sustainable development. The RRTP cuts across this spectrum, with staff and students of the program contributing as environmental advocates of all these disciplines:

1. **Environmental Protection:**
   Environmental protection includes a range of activities intended to set aside special lands and resources for protection from anthropogenic impacts.

2. **Control:**
   This field is concerned with monitoring and mitigating the negative impact of human activity. It focuses on the areas of pollution control, emission standards and the cleanup of toxic wastes.

3. **Conservation:**
   The field of environmental or biological conservation includes the traditional resource management of wildlife, fisheries and forestry which focus on the maintenance and management of living resources.

4. **Sustainable Development:**
   As an emerging field concerned with making sure that what we do to meet our needs in the short-term does not eliminate or limit the ability of future generations to meet their needs, sustainable developers take a proactive role in designing a future which harmonizes with the environment, rather than subduing it.

5. **Education:**
   Cutting across the spectrum of environmentalism is the need for education at all levels. The International Strategy for Environmental Education (UNESCO-UNEP 1987) recognizes that the best way to ingrain an environmental ethic in learners is to integrate environmental thinking into the delivery of a wide range of instruction. The RRTP curriculum tries to incorporate environmental thought into nearly all the courses delivered. Ideally, the College would also like to integrate environmental ethics into such non-traditional areas as heavy equip-

ment operation, carpentry and teacher training.

As environmental advocates, the students and alumni of the RRTP have been able to enter the environmental debate on a wide variety of fronts. They have been able to wear different hats and to create opportunities to be effective.

Program Outcomes

By far the greatest impact the RRTP has had in the north has been achieved through the success of its alumni. One hundred and four students have graduated from the program since its inception in 1980, with the majority working in their field of interest. Entry level job titles have included: Renewable Resource Officer; Wildlife Technician; Environmental Protection Officer; Fisheries Officer; Park Warden; Water Resources Technician; Conservation Education Officer; Assistant Resource Management Officer; Wildlife Biologist Trainee; Land Claims Officer; Consultant; etc. The current President of the NWT Metis Nation is an alumnus and two graduates have risen to senior management positions as high as Regional Superintendent.

In addition to meeting the demand for trained northern technicians in the renewable resource and environmental fields, the staff and students of the program have been able to contribute to the environmental debate and the resolution of issues on a variety of fronts. Much of the activity and successful outcomes of the program have been due to the involvement of the program's chairperson due to his position in the community which has provided him with many opportunities for his students' involvement.

1. Debate over the Future of the Thelon Game Sanctuary

Arguably the most pristine, most biologically spectacular intact ecosystem in North America, the Thelon Game Sanctuary is one of the best protected pieces of wilderness real estate in the world. When the RRTP students became aware of the federal government's intention to review the boundaries of the Thelon with the view toward revising the boundaries to allow for expanded mineral exploration, they took the opportunity to witness the Beverley-Kaminuriak Caribou Management Board debate their position on the boundaries of the Thelon.

The RRTP Chairperson also participated in the boundary debate as a member of the Denendeh Conservation Board and assisted in shaping the

recommendation which was accepted as the position of the Government of the Northwest Territories.

The RRTP participants helped to influence the positions of leading Canadian conservation organizations on the issue of the Thelon, including the Canadian Wildlife Federation and the Canadian Nature Federation.

In the end, all environmental advocates agreed that the boundaries of the Thelon should remain intact, that no expansion of the mineral exploration activities should be allowed, and that the only changes which should be considered would be to expand the boundaries of the sanctuary to give increased protection to the calving grounds of the Beverley caribou herd. In light of the strong and united opposition of the environmental groups and with the backing of the NWT government, the federal government abandoned any intention of revising the boundaries of the Thelon Game Sanctuary.

2. Debate Over the Proliferation of Pulp Mills in the Headwaters of the Slave-Mackenzie River Basin

RRTP students and staff have been active participants in this public debate:

- Mr. Van Camp prepared the briefs presented to the Alberta-Pacific environmental assessment panel by the NWT Wildlife Federation and the Town of Fort Smith as well as helping to shape the position taken by the Government of the Northwest Territories (GNWT) throughout the hearing and in subsequent court challenges and ongoing negotiations.

- Another staff member contributed fish samples to the federal investigators from which it was determined that organochlorine pollution from existing pulp mills on the Peace and Athabasca systems was already detectable in waters flowing into the NWT.

- The College has also been cooperating with the GNWT, federal government agencies and the Science Institute of the NWT in support of a $12.4 million federal-provincial study into the effects of pulp mill pollution on the northern watersheds, the pilot phase of which is a South Slave Research Facility.

3. Debate Over the Northern Diseased Bison Issue

Prior to the Federal Environmental Assessment Review Office (FEARO) public hearings on this issue, students had been exposed to the many facets of the problem. They travelled many times into the Sweetgrass prairies of Wood Buffalo National Park and to the Mackenzie Bison Sanctuary on botany, wildlife biology and wildlife management course field trips and had assisted experts in obtaining samples from bison and other mammals for disease testing. Thus, the students were able to attend the hearings and observe first-hand the workings of the FEARO process as well-informed members of the public.

4. Examination of the GNWT Sustainable Development Policy

With a view to implementing the GNWT sustainable development policy in Fort Smith, one class of RRTP students examined the policy and presented their findings to the Fort Smith Town Council. Among their ideas were the need for a comprehensive review of the town's waste management system and the need for a coordinated approach to identifying and protecting natural areas in the town. The mayor, council and town administrators carefully considered the students' recommendations and prepared a point-by-point response. The exercise successfully raised the profile of environmental issues before the municipal government.

5. Formulation of Accreditation Standards for Wildlife Technology Programs

Through its participation in the North American Wildlife Technology Association, the College was able to contribute to the formulation of accreditation standards for wildlife technology programs in other regions of North America. In the future, the College hopes to address the formal integration of an environmental component in the training of all wildlife technicians.

FUTURE ADVOCACY ROLES

Staff and students of the RRTP have attempted to be effective environmental advocates in each of the roles described above but there are other avenues available which have not yet been seriously pursued:

1. Alumni Networking:

During the summer of 1990, the RRTP held its first reunion. Out of that effort it is hoped that a more active alumni network will be developed. Since graduates of the program are in place in the field of

renewable resources in all parts of the Northwest Territories, the alumni network could be a very effective way to get environmental information to people well positioned to use it.

2. **Adjunct Relationships:**
   So far, three graduates of the RRTP have gone on to study Environmental Resources at the university level. It is hoped that in the long term an adjunct relationship with a degree-granting institution can be established for students wanting to continue their studies after they have completed the RRTP. Such a relationship would also extend Arctic College's own professional networks by opening opportunities for staff exchanges and research support.

3. **Green Campus Initiatives:**
   There are many ways in which colleges and institutes can enhance their environmental citizenship and lead their communities by example. For instance, Arctic College is attempting to influence the design of its new library and Applied Arts building to be as energy efficient and environmentally sensitive as possible.

4. **Advocacy Recognition and Reward System:**
   Apart from the satisfaction of gaining benefits for the community, the college and the students, there are precious few personal rewards for the dedicated advocate. Many of the advocacy roles already described require a major contribution of extracurricular effort. They also require that individuals involve themselves in controversial issues and invest large amounts of personal time and effort to be effective. Advocates may have to take personal and professional risk - another disincentive to becoming an effective advocate. An intra college/institute (or ACCC award) system which recognizes advocacy effort for the environment and other fields would be a positive incentive.

CONCLUSION

Because of their local focus, applied orientation, objectivity and academic status, colleges and institutes of technology are uniquely placed to be effective advocates for the environment. The staff and students of Arctic College's Renewable Resources Technology Program have contributed tothe resolution of local environmental issues, including environmental protection, pollution control, resource management, sustainable development and environmental education. Advocacy roles have included cur-

riculum design, consulting services, research and public presentations. The Fort Smith community has benefited through increased access to information as well as professional networks. Benefits to the college have been through increased integration with the community, curriculum enhancement and professional development opportunities for staff. Students have benefited through exposure to real world issues and events, problem solving, as well as opportunities to make contact with potential employing agencies.

Suggestions on how professional educators can play a greater role in advocating for the environment can be found in the Tools Section of this Green Guide.

Technical training in water treatment:

A FIELD OF EXCELLENCE AT CÉGEP DE SAINT-LAURENT, VILLE SAINT-LAURENT, QUEBEC

PREPARED BY

Marcel Brien
Advisor to the General Director for Cooperation and Development

and

Monique Tardat-Henry
Instructor, Sanitation Department

INTRODUCTION

In Quebec, there are three levels of training available for the treatment of water:

- water treatment operators (secondary vocational training)
- water treatment technicians (college vocational training)
- university graduates with an relevant specialisation, e.g. a master's degree in environmental studies.

The three levels are complementary to one another, i.e. engineers work in close cooperation with water technicians in developing and supervising treatment stations; plant operations are overseen by operators and technicians who consult each other on a regular basis. Cégep de Saint-Laurent, with more than 25 years of expertise in the field, now plays a significant role in water treatment training.

THE HISTORY OF WATER TREATMENT PROGRAMS AT CÉGEP DE SAINT-LAURENT

Professional training in water treatment techniques began in 1964, with the first class graduating in 1967 through the Institut de technologie de Vaudreuil, an institution which was partially integrated with the Cégep de Saint-Laurent in 1968. Since then, Cégep de Saint-Laurent has been the only institution in Québec to offer a complete technical training program in this field.

As trainers of a large part of the specialized labour force required in filtration plants (drinking water) and in waste water treatment plants, Cégep de Saint-Laurent has been able, over the years, to adjust its programs according to current requirements thanks to the feedback of its

own graduates working in the field. Based on a series of industrial advisory committee meetings — involving stakeholders at every level of training, as well as private and government groups and professional associations — Saint-Laurent has undertaken a thorough revision of its training programs, developed new equipment for training purposes (computer applications and monitoring in particular) and supplied the government with useful analyses on water management.

With funding from Quebec's Ministère de l'enseignement supérieur et de la science (department of higher education and science), the Cégep has also published original works on a variety of topics, including water chemistry, water treatment, technical specifications in water management, elements of hydrology, instrumentation and automation. Each of these documents was launched at an annual symposium on water management. They are used not only by the Cégep itself, but in universities and places of work in many Francophone countries.

At present, instructors of the Cégep's Sanitation Department are producing manuals on sanitary microbiology, fluid mechanics and waste water management.

OTHER ENVIRONMENTAL PROGRAMS

In 1972, Cégep de Saint-Laurent established a second professional training program of an environmental nature: Air and Physical Environment Management Technology. Over the years, the "physical environment management" portion of the program gradually became more important than the "air quality" portion and, in 1983, the program was modified and combined with the Prevention Techniques program offered by the Cégep de Jonquière. Since that time, the program has come to be known, in both institutions, as the Industrial Management and Security Program.

Graduates in Industrial Sanitation work in public, para-public and private organizations where they are involved in measurement and monitoring, training and information, and environmental assessments. Indeed, the legislation regulating health and safety in the workplace, as well as environmental quality, is forcing employers, unions and governments to work together to improve worker health and safety, and to monitor contamination of air, water and soil to ensure that their operations do not threaten the well-being of the population or the environment.

In this area as well, Cégep de Saint-Laurent is cooperating with con-

cerned specialists and with industry to obtain the kind of feedback that is needed to continually review training and keep it relevant.

The Cégep has also produced some highly important teaching material written by some 20 specialists in a variety of fields and grouped under the title "Hygiène du travail" (Health and Safety in the Workplace). In 1986, the collection was awarded a prize by Quebec's Minister of Higher Education and Science. Another document dealing with testing for environmental pollutants is now being produced.

BEYOND THE REGULAR TRAINING OF YOUTH AND ADULTS: CUSTOM PROGRAMMING

With its expertise in developing tailor-made training in computer assisted design (CAD), Cégep de Saint-Laurent has been able to offer municipalities and industries individualized training in the field of water treatment.

Since the fall of 1988, a number of municipalities in the Montreal region (Farnham, Repentigny, Ste-Thérèse, Blainville, St-Eustache and more recently, Ville de Laval) have received or are receiving training in the general area of water treatment as well as in hydrology, water chemistry, aqueduct and sewer network management, instrumentation and automation.

Since applicants for training or upgrading come from all parts of the province, the Cégep has devised a formula as-yet-untried in other colleges. This consists of an intensive training program in which water treatment workers come for training sessions at the Cégep, alternating with work sessions at their usual place of employment. The training leads to a college certificate (CEC - Certificat d'études collégiales) after two years and allows workers to meet provincial regulatory requirements.

This new approach was launched in January 1990 and presently involves 17 individuals from as many municipalities, including Val d'Or, Lac Mégantic, Dolbeau and Joliette.

Industries having to deal with the discharge of pollutants are also starting to seek out the Cégep's tailor-made training programs to help them sort out the problems they are facing. Since 1990, companies like Shell Canada in Montréal, as well as IBM and General Electric in Bromont, have obtained training services in wastewater management under the guidance of Cégep de Saint-Laurent.

The Cégep is also offering a seminar program in industrial sanitation to the personnel of the Department of National Defense, in cooperation with Humber College in Toronto which is offering the English version of the program.

INTERNATIONAL COOPERATION IN THE AREA OF WATER TREATMENT

During the last year, Cégep de Saint-Laurent has taken part in cooperation projects in water treatment in Francophone Africa. The first project of this kind was set up with CREPA, a regional centre for drinking water and low-cost water purification located in Ouagadougou, Burkina Faso. Through one of its instructors, the Cégep also took part in a national seminar in Nouakchott, Mauritania in March 1990, and a regional seminar in Ouagadougou, in conjunction with the École polytechnique de Montréal in June 1990. At that seminar, 12 nations of Francophone Africa were represented. CREPA, which has had its funding extended into 1991-1994, has invited the Cégep to work cooperatively in the following areas: technical assistance in setting up a water testing laboratory, scientific publications, and regional seminars in trainer training and technical upgrading.

Another institutional cooperation project was launched in the spring of 1990, in conjunction with the Société Nationale des Eaux (SNE) in Niger. This corporation, created in 1987, has integrated all activities relating to the production of drinking water in all areas of Niger and is now planning to completely restructure its organization. Since training is its first priority, the SNE sought out Canadian assistance in this area. Cégep de Saint-Laurent will provide the necessary assistance, within the framework of the Project Development Fund set up by the Canadian International Development Agency (CIDA) and managed by the Association of Canadian Community Colleges.

THE SPECIFIC NATURE OF THE CÉGEP'S ENVIRONMENTAL INTERVENTIONS

One must look at the specific nature of the training being offered at Cégep de Saint-Laurent to truly understand what makes it so interesting and in such high demand both in Quebec and internationally.

At Cégep de Saint-Laurent, a point is made to offer basic training which is broad enough to allow technicians to enter a wide variety of current and future technical fields. Practical considerations, manual skills,

electromechanics and the development of personal initiative are also stressed.

A second important feature of this training is that it provides future technicians with a global perspective on the environment and, more specifically, an awareness of the inter-relatedness of water, air and soil pollution, agricultural development, deforestation and soil erosion.

This knowledge is essential for technicians, given the ever increasing industrialization of developing countries. It is to be hoped that this development will not follow the Western model, i.e. that it will be more respectful of the environment. Today, we are familiar with the prohibitive cost of cleaning up and rehabilitating environments that have been ravaged by unbridled development. Cégep de Saint-Laurent has had the opportunity to study the evolution of environmental problems for more than two decades and, by transcending the simple ecological approach has also examined technical means of preventing or controlling those problems.

Finally, with regard to the specific nature of Cégep de Saint-Laurent's training, it is important to stress that the Cégep's most important strength resides in a few hundred technicians who, after graduating, have gone on to gain work experience or to pursue their studies in universities and engineering schools, where they represent an incredible source of experienced trainers. They are now being joined by new graduates who have enthusiastically taken part in the SENS-Technique program and are eager to make their contribution to the environment and to sustainable development.

Planting seeds for sustainable development

ASSINIBOINE COMMUNITY COLLEGE - BRANDON, MANITOBA

PREPARED BY

Mark A. Burch
Coordinator, Sustainable Development
Education Development Centre

INTRODUCTION

Assiniboine Community College (ACC) has a total staff complement of approximately 180 on-campus instructors, support staff and administrators. Full-time day enrolments at the main campus include about 700 students, with an additional 8,000 students participating in evening, continuing education, off-campus community-based training and distance education programs. Assiniboine College operates satellite campuses in Dauphin and Russell, Manitoba. The college currently offers 29 certificate and/or diploma programs in trades, technologies, applied arts, human services, agriculture, business and health services.

Before the terms "sustainable development" or "environmental education" came to be associated with specific persons, committees or activities at ACC, individuals and departments were already engaged in activities which contributed to environmental sustainability of training and development. The Agricultural Training Divison had been delivering community-based and distance education training programs which stressed the sustainable development of rural communities, sustainable approaches to agricultural production, and diversification of the rural economy through entrepreneurship and cottage industry. "Bridging for Rural Women," a distance education initiative designed to help rural women secure on/off-farm income opportunities was a specific example of sustainable community development. Soils, The Living Blanket was also produced locally in video format and received wide recognition as a seminal treatment of sustainable approaches to the management of prairie soils. In addition, some instructors incorporated conservation practices in the way they designed and delivered their training programs. An environmental issues course was designed by a Business Education instructor in the early '80s, and environmental awareness was routinely stressed in other areas of

training such as the building trades, air conditioner servicing and applied agriculture.

A generally heightened co[illegible] for environmental issues was focused in July 1989 by a proposal from line support staff that the president of the College establish an internal advisory committee to review the College's record of environmental citizenship and recommend appropriate actions. ACC's "Sustainable Operations Committee" was established in December 1989. Coincidental to the formation of the committee were initiatives within the Province of Manitoba to establish sustainable development as a priority for provincial economic development policy, the formation of the ACCC Environment Task Group, the opening of the International Institute for Sustainable Development in Winnipeg, and a blossoming of local community action concerned with environmental education, recycling and conservation issues. All of these developments began with grassroots initiatives and served to establish a progressively more favourable climate for attention to environmental education.

By May of 1990, one staff person was seconded by the president to undertake a special full-time project to explore the meaning and implications of sustainable development and environmental issues for the College's future, work to increase instructor and support staff awareness of the issues, develop contacts with agencies and departments involved in environment sector activities, and explore partnerships with community groups, business, environmental groups and the university. The Sustainable Operations Committee became a combination think tank and self-education group in consultation with the new Coordinator, Sustainable Development.

At the same time, the Agricultural Training Division started development of a new program, "Ag Chemicals for the '90s," a training program for agricultural producers with a marked environmental component, and explored a training program in sustainable silvaculture and also agriforestry.

During the first year of these activities, support for environment/sustainable development concerns was not wide-spread. The Manitoba Civil Service had undergone substantial reductions and ACC remained part of the Provincial Department of Education. Budget constraints, staff reductions and management structure transitions all contributed to ambivalence toward future oriented initiatives. Many staff, instructors and managers shared a general concern for environmental education, but much

energy was focused on institutional survival and the transition to a board-governed corporate structure. As desirable as education for sustainable development might have been, it was perceived by many to be a "warm fuzzy," a frill, or the prerogative of universities or large eastern colleges. Another year would pass before environmental sustainability came to be seen as a central part of strategic planning regardless of the size or geographical location of one's institution.

In June of 1991, the Coordinator, Sustainable Development was seconded to the International Institute for Sustainable Development in Winnipeg on a six month project contract. During this period, a new president and two new vice-presidents were named to their positions at the College and environment/sustainable development education took its place among several other strategic goals for the future. In November 1991, special task groups were established around each of five strategic concerns, one of them being sustainable development. By January 1992, education and training for environment sector employment had become part of the College's strategic plan. The Coordinator, Sustainable Development, returned from secondment in January 1992, and a full-time position was assigned to this initiative with the Education Development Centre, the division responsible for program development, program evaluation and staff development. The Sustainable Development Task Group reported on its deliberations on March 31, 1992 and included recommendations — - among them, the recommendation that a Standing Committee of Management Council be created to oversee and advise on sustainable development activities.

The role of Coordinator for Sustainable Development underwent substantial revision. On the one hand, sustainable development was rightly perceived to be central to good management practice. All instructors, support staff and administrators should include environmental, economic and social considerations in their decision-making. On the other hand, it was considered desirable and necessary to establish a visible individual and centre within ACC to catalyze and support a process of change in the transition to more sustainable patterns of college operations. Staff and students needed someone to whom to pose questions and somewhere to go for resources and assistance, at least initially. Accordingly, the role of the Coordinator became more focused on building a resource base environmental information, assisting with review and revision of specific curricula, building awareness of the implications of environmental issues within the College and providing developmental stimulus and support to the creation of new programs aimed at environment sector careers.

Presently, Assiniboine College maintains one full-time position as Coordinator, Sustainable Development, a standing committee of its Management Council concerned with sustainable development, a student organizing committee for environmental activities, two program development advisory networks (for a new program in Sustainable Agriculture and a program in Sustainable Shelter Technology), as well as numerous local, regional, national and international information sharing networks and collaborative groups. Environment and sustainable development objectives have been included in the College's strategic planning process and the institutional mandate is being revised to reflect these interests.

ACTIVITIES

Since September 1990, when an identifiable initiative in sustainable development first got under way, many activities have been undertaken to mobilize interest and action around environment/sustainable development concerns.

Early in 1990, the Department of Government Services, which is responsible for the operation and maintenance of college buildings, instituted college-wide recycling of office waste paper. The company with the contract to provide food services also initiated a review of its operations aiming toward waste minimization within food services. Both of these developments were undertaken independent of later environment-related initiatives at ACC.

One focus of Sustainable Operations Committee meetings was to reach beyond self-education of members to provide information resources for both ACC and the community. The Committee started publishing an in-house newsletter titled Greentips which provided practical information on how to conserve resources and recycle wastes in classrooms, offices and the home. Greentips was circulated widely within the institution, but was also mailed to schools and community organizations. The Coordinator, Sustainable Development published regular contributions to ACC FOCUS, the college internal newsletter.

From 1989 to 1990, program development work in the Agricultural Division which has the mandate to deliver applied agricultural training province-wide, focused on developing a Soil and Water Management training program for producers, a Soil and Water Management Technician program and delivery of sustainable agriculture projects for northern and isolated First Nations communities. Other important initia-

tives took the form of ACC's Family Farm Survival Course and Bridging For Rural Women, both of which addressed the human resource development aspects of sustainable rural development.

A staff development day was convened for all College instructors, support staff and managers to provide a general orientation to the topic of sustainable development. A one day staff development workshop was also held on recycling and waste minimization in the classroom and at home. Both of these events were very well attended.

A resource centre and pamphlet rack were set up and source files created for every major program area in the College. Material related to environment and specific training areas was compiled and loaned to interested instructors and students.

An all-college "Sustainable Development Day" was also convened in March of 1991. The purpose of the day was raise awareness concerning environment/sustainable development and its implications for College training programs and the careers for which they were preparing trainees. Eleven resource people were assembled from around the province to present the environmental perspective on each major training division. Business students, for example, heard a presentation on "green investing"; nursing students learned about environmental health; building trades students saw a presentation on energy conserving construction techniques; childcare services students learned about environmental education activities for pre-school children, etc. The day also featured a keynote speaker and nine large exhibits from environmental, conservation and sustainable development organizations and agencies.

Another activity involved department heads and college administrators in creating a "Green Plan" for Assiniboine College. The Green Plan exercise was a first (and very rough) cut at taking an environmental perspective of past and present program operations. A questionnaire was prepared and distributed to all chairpersons, department heads and interested instructors asking:

(a) What environmentally friendly activities were they already undertaking in their operations, what new activities could be initiated at no cost and what could be proposed if extra funding was available;

(b) What environmental content was already included in existing programs, what could be added at no extra cost and what should be

added if extra resources were available;

(c) What proposals could be made within existing funding for new programs and what should the college be attempting with additional funding.

The feedback from these questions was collated, culled for duplications and published as a "Green Plan." The Green Plan identified 42 specific examples of environmentally sustainable or conserving practices currently in use at ACC and proposed 65 interventions or innovations which would advance this process still further. Some would require new funding; others could be achieved within existing budgets.

The Green Plan never clearly identified goals, objectives, responsibilities, deadlines or funding implications. But it did serve as a first "mirror" within which the college management and faculty could assess the current state of ACC's environmental achievements and aspirations. Modest and crude as the Green Plan was, and as limited as the input to it had been, it was a "first" in Manitoba insofar as no other major public institution had attempted such a self-assessment. The value of the Green Plan exercise as a consciousness-raiser and potential planning tool was obvious to all who were involved. Most significant was the resolution by Management Council to repeat a more thorough Green Plan exercise with the mandated participation of all instructors, administrators and support staff.

Concept papers, critiques, course proposals and briefing notes were prepared by the Coordinator, Sustainable Development, for administrators or as contributions to regional and provincial level policy consultations. Few of these products resulted in concrete change although they did have value in drawing forward both awareness and strategic thinking on environmental education and sustainable development.

Assiniboine College partnered with staff from the Department of Family Services to establish a planning committee comprised of representatives from all provincial offices in the City of Brandon to coordinate waste paper collection for recycling. Recycling activities varied widely across different departments of the provincial civil service. This committee performed a waste paper volume audit and also explored collection services available to provincial offices.

Since January 1992, environment/sustainable development activities

have broadened considerably at Assiniboine College. Two new programs are being developed with the participation of a number of partners: Sustainable Agriculture and Sustainable Shelter Technology. The Agriculture program is being coordinated through the College's Agriculture Training Division while the Shelter Technology diploma program is being coordinated by the Coordinator, Sustainable Development in cooperation with the Engineering Technology and Trades Division. Both of these offerings will be major new program initiatives.

The Education Development Centre has drafted a model for comprehensive program review and curriculum development for environment/sustainable development training. The draft model has been vetted to nearly two dozen reviewers across Canada including many curriculum experts in the community colleges, Environment Canada, the International Institute for Sustainable Development, the World Wide Fund for Nature, the Manitoba Round Table, the National Round Table, the Foundation for International Training and the Environmental Education Branch of the U.S. Environmental Protection Agency. The model, when finalized, is designed to provide a uniform set of program evaluation criteria and methods to be applied to all programs across the college. It is hoped that sustainable development objectives can be framed for all existing programs so that environmental concerns avoid being "ghettoized" in specialized departments or subjects.

OUTCOMES

It may be too early to assess the results of the activities described above. No systematic, rigorous measurement of outcomes has been carried out so far. Certainly, summative evaluations will be done on programs and services when they are ready to be offered.

It would be a mistake to suppose that some great green wave of consciousness has inundated ACC and that all of its staff are happy woodland elves working for the salvation of the planet! After two years of effort, there has been some change. More people are talking about the future, about the role of environment in planning. More money is being spent in this area. More consideration and discussion time is being given during decision-making to concerns with environmental sensitivity. The process of increasing involvement, however, has often been a matter of one-on-one interactions and small group discussions on several occasions. Especially important is identifying specific examples of how progress toward environmental sustainability means doing something differently.

Instructional staff especially find it easiest to "buy in" when they can see specific examples of objectives, materials, classroom exercises, etc. which address their subjects from a sustainability perspective. Readiness to support sustainable development has been an incremental process, at least at Assiniboine College.

Of key importance has been the enthusiastic support of ACC's senior administrators. Beginning with former President Richard Mackie (also former Chair of ACCC), who sanctioned the first special project to explore sustainable development, through the strong support of ACC's current President Brenda Cooke, and its Academic Vice-President Gerald Bashforth, environmental concerns have moved from peripheral "nice-to-haves-if-you-can-afford-it" to central dimensions of planning and decision-making.

This process has been made easier by the general growth in public awareness that our present economic, social and ecological arrangements cannot be sustained over the long term. There is a growing readiness to consider realistic alternatives and this readiness is slowly translating itself into the energy needed for innovation.

Building from its beginnings in Agriculture and community-based training, many activities have been completed within the last 24 months: the Greentips newsletter, a first Green Plan, a program review model, strategic objectives for sustainable development, a Standing Committee on Sustainable Development, a Sustainable Development Task Group, a Coordinator of Sustainable Development, a small curriculum bank, a small resource centre, many concept papers, two major program proposals, many meetings and discussions, class presentations and staff development events. Five years ago, none of these things existed. Perhaps these are the "results." What matters most, however, is whether any of it finally translates itself into a more benign relationship between human activites and the natural world.

FUTURE PROGRAMS AND PLANNED ACTIVITIES

The role of sustainable development/environment education at Assiniboine College is changing rapidly as more people become involved and more opportunities present themselves. A major goal is to move sustainable development education out of the realm of specialists and into the mainstream of decision-making and program development at the college.

1. A feasibility paper and proposal to senior administrators has been prepared regarding a comprehensive environmental audit of both the College's physical plant and its operations. Eleven private consulting companies were surveyed to identify those offering services which best integrated the process of environmental auditing with line staff education activities. The environmental audit is seen not only as a measure to reduce costs and improve environmental stewardship but also as a significant staff development opportunity.

2. At this writing, Assiniboine College is planning a partnering event with the Eco-Ed Conference to be held in Toronto in October 1992. Unlikemany partnering event proposals, ACC is proposing not to send staff to Toronto, but to bring the Eco-Ed Conference to Western Manitoba. This will be achieved by distance technology whereby plenary events and concurrent symposia will be transmitted by satellite to two downlink centers in Manitoba. Local organizers will build discussion groups, reaction panels and other local activities around these video programs. In addition, participants at ACC will be linked to some Eco-Ed events by teleconference so that questions and comments can be offered. ACC's contribution to Eco-Ed will consist of a symposiumevent created in Western Manitoba carried by two-way interactive video between Toronto and Brandon.

3. Assiniboine College has surveyed instructional and support staff regarding their interest in environment/sustainable development concerns, the time they have available for staff development activities and the subjects of most interest to them. The results of this survey are being used to design a series of staff development programs to address awareness building, writing training objectives, evaluating programs and emerging trends in environment sector industries.

4. Planning is under way to offer a "Summer Institute in Sustainable Development" which would explore a much more comprehensive treatment of the subject, its origins and implications. One of the objectives of the summer institutes would be to prepare trainers to work within their own businesses, institutions and agencies on sustainable development education.

5. ACC is actively pursuing partnerships within multi-institution consortia for sustainable development training. Partnerships have already been explored between ACC and the International Institute for Sustainable Development, the Foundation for International Training,

the Manitoba Home Builders Association, the Canadian Mortgage and Housing Corporation, Environment Canada and regional organizations such as Brandon's "January Group," a community-based group seeking to establish an Agro-Ecology Centre for Western Manitoba. Through these partnerships, Assiniboine College will become a key partner in regional community development and progress toward more sustainable patterns of rural development in Western Canada.

The institute of urban ecology

DOUGLAS COLLEGE - NEW WESTMINSTER, B.C.

PREPARED BY
Valentin Schaefer
Instructor, Department of Math and Science

INTRODUCTION

Douglas College has a long history of conducting community projects with environmental themes. Three of these were reported previously in the ACCC publication: **Making Canada Productive: Creating New Partnerships - Selected Cases (1986).** These projects have employed Douglas College students and provided them with valuable, career related job experience. At the same time, these projects have contributed to the quality of life in our community. The College has been producing biophysical inventories and resource materials in environmental education since 1984. This involvement was formalized this year by the establishment of the Institute of Urban Ecology.

The need for community projects in urban ecology became apparent when a number of municipal and regional government representatives were approached for student co-op job placements in 1983. Few positions were found at the time due to a lack of funding. However, it was clear that there was much environmental work which needed to be done. The government representatives were eager to have college students participate and they were confident that students, with faculty supervision, could conduct meaningful studies and produce valuable results. Especially appropriate were general biological overviews of urban parks, and descriptions of natural history and environmental problems.

When the college fundraiser (Resource Development Officer) sought funding for some of these projects, an obvious source was Employment and Immigration Canada. Three proposals were initially drafted: an overview of the natural environment of Deer Lake, a biophysical inventory of Burnaby Lake Regional Park, and an intertidal and subtidal inventory of Belcarra Regional Park. Later proposals included nature guides, publications on environmental issues, a training program for park naturalists and producing resource materials for a naturalist group.

All proposals were funded. In the 1984-1989 period, these projects employed 44 people, 26 of whom were Douglas College students, for periods of 14 weeks to one year. The funding came from various federal job creation monies - Environment 2000, Canada Works (section 38), Job Development, and Challenge programs. In all, over $300,000 in funds were obtained, with the major grants obtained in partnerships with the Greater Vancouver Regional District, the Municipality of Burnaby, the Federation of B.C. Naturalists and the University of Victoria.

The activities were confined to four main areas. These are listed below along with the publications which resulted from each:

A. Inventories of Natural Environments

1. The Natural Environment of Deer (1984)
2. Biophysical Inventory of Burnaby Lake Regional Park (1984)
3. Biophysical Inventory of Belcarra Underwater Marine Park (1984)
4. Natural History of New Westminster (1984)

B. Materials for Training Environmental Educators

1. Interpreting Nature: A Primer for Understanding Natural History - Volume 1 (Ecology, Geology, Astronomy, Plants) (1988)
2. Interpreting Nature: A Primer for Understanding Natural History - Volume 2 (Animals) (1988)

C. Environmental Education Materials for the Public

1. A Nature Guide to Urban Parks (1986)
2. Environmental Issues in the Lower Mainland (1987)
3. Protecting the Environment - What One Person Can Do (1989)
4. Environmental Issues in Greater Victoria (1991)

D. Assisting Nonprofit Organizations

1. A History of the Federation of B.C. Naturalists (1988)
2. Policy Manual for the Federation of B.C. Naturalists (1988)

In each case, the publications were researched and written under the supervision of Douglas College faculty. In some cases where the faculty did most of the writing, they also appeared as authors. One hundred copies of each report were printed. A second hundred copies of the books A Nature Guide to Urban Parks and Environmental Issues in Greater Victoria were reprinted. The book Protecting the Environment - What One Person Can Do was also reprinted to 1,000 copies. All three of the

reprinted books were sold to the public. The distribution of other reports was confined to interested parties. The reports on the inventories of natural environments were each accompanied by an educational brochure printed in the thousands and distributed to the public by mail or by students.

The quality of the results was praised. In each project where technical expertise was required, experts as well as students were hired to ensure a high standard. In addition, the educational materials were complimented for their readability. The approach in producing these materials was to generally have the first drafts written by the students. As a result, they were less "academic" than if they were exclusively written by faculty - the vocabulary and sentence structure was more appropriate for the general public.

The book Protecting the Environment - What One Person Can Do was featured in a radio interview on CBC's Almanac in Vancouver with a College faculty member and a participating student. Environmental Issues in Greater Victoria resulted in a one-hour cable television show prepared by a College faculty member and was aired several times in Victoria during the spring of 1991.

DEVELOPMENT OF THE INSTITUTE

It became clear shortly after the projects began that there was a great demand for this type of work in the community. It was also clear that those involved were interested in expanding to a level of involvement which was beyond the capacity of faculty to maintain with the casual arrangements used so far.

At one time Douglas College had an Institute of Environmental Studies. It was formed in 1970 when the College was created and it was very successful. Two faculty members ran the Institute and taught most of the non-credit courses associated with it. The Institute of Environmental Studies produced numerous monographs on waterfowl and Fraser River wetland issues. It also produced a six-part video documentary on the history of the Fraser River. In 1981, however, Douglas College "split" with the operations south of the Fraser River (including the Institute of Environmental Studies), which then became Kawantlen College. Since that time, the Institute has lost support and is no longer very active.

While the original Institute of Environmental Studies at Douglas College

was involved in environmental issues in the community, its concentration on waterfowl and wetland did not have the broad range of involvements seen later at the "new" Douglas College. It was also not as successful in raising funds for projects and it did not employ students to conduct projects.

An "Environmental Science Centre" was proposed for the "new" Douglas College as early as 1985 and was quickly approved at the department level. However, it was difficult to obtain support in the remainder of the institution primarily because of the necessary financial support. A key aspect of the "Centre" would be a paid Director who would administer the projects, develop new proposals, and handle most of the supervision of the students and staff. It was clear that, at least in the long term, it would be necessary to secure additional funds elsewhere.

In addition to securing funds, it was also imperative to clarify its mandate. There were criticisms that the staff of the Institute were operating as environmental consultants, which was considered inappropriate for a college. In response, it was pointed out that the projects were more general and exploratory than those usually done by consultants. Also, the Institute's projects tended to cross response or topics, which was not normally done in consulting contracts (or through similar government employees) due to specialization and compartmentalization of fields of study. Consultants and government are also more hesitant to discuss certain issues because their statements may be misrepresented as "policy" by the public. Nevertheless, such overviews are very important in empowering the public in understanding nature and environmental issues.

In 1990, the College's fundraiser discovered that the Real Estate Foundation might be interested in donating an endowment to support the Centre. In the process of arranging for donations to the Douglas College Foundation for Scholarships and Bursaries, she mentioned the Institute's environmental projects and the Real Estate Foundation agreed to receive a proposal. The Foundation then suggested an arrangement where an endowment of $500,000 might be contributed, to which they would contribute half the amount and the College try to obtain matching donations from other sources. The interest from the endowment would be used to fund the Director position and provide the long term stability being sought.

BARRIERS AND OUTCOMES

Considerable difficulty was encountered in developing the funding proposal for the Real Estate Foundation. The name was changed from the "Environmental Science Centre" to the " Institute of Urban Ecology" to clarify its mandate and avoid confusion with other centres operating in the College. There was also some debate about the scope of its mandate, and the content of its "Mission Statement" and "Goals and Objectives." Ultimately, the following was decided upon:

> The Mission Statement decided upon for the Institute is as follows:
>
> "... to enhance the livability of B.C.'s lower Mainland, providing expertise, resources and leadership on sustainable development." The emphasis on sustainability and livability was a direct response to the commitment of the Greater Vancouver Regional District in pursuing these goals in the past, and its stated future intentions. Our previous work was directly relevant to these aims.
>
> The Objectives of the Institute covered three areas:
>
> 1. **Land Use Planning** - to develop and maintain an objective information base for planning decisions
>
> 2. **Urban Environment** - to foster an understanding of environmental concerns in urban areas, and encourage sustainable lifestyles
>
> 3. **Education** - to promote an environmental ethic within public education and decision-making processes.

The Institute was intended to be freestanding and autonomous.

However, it was operated under the College's name, using College support services and facilities. The Institute's policies and mandate were to be decided upon by a Steering Committee reporting to the College Board. The Academic Dean would sit on the Steering Committee as the line administrator. The Institute would be run by a Director who would be responsible to the Steering Committee.

One consideration was to ensure that the Institute was broadly based within the College. At that point, almost all of the major works which

formed the rationale for the Institute came from the Biology department (Geology was involved in one community project). In order to ensure the input and participation of other areas, it was decided that the Steering Committee would have representatives from several areas within the College. This committee would decide on the Institute's involvements and operations, and would serve as a valuable avenue of communications for the Institute's business within the College.

There was disagreement over the nature and job description of the Director position. One point of view was that the Director should be a faculty member, preferably filled by a secondment of a faculty member already on staff. A second point of view was to not restrict the appointment to a faculty member, but to also consider other experts who would not be expected to teach, and may not even have teaching credentials, but may perhaps have more expertise in the responsibilities of running an institute. Eventually it was decided that the Director would be a faculty member to be selected by the Steering Committee and a job description was written.

The Steering Committee was formed first and was represented by the departments of Biology, Chemistry, Geography, Geology, Sociology, Community Programs and Services, the Resource Development Office and the Academic Dean. Its initial task was to deal with the more difficult outstanding issues of the Institute's structure and nature of the Director's position. These two issues took a year to resolve to the satisfaction of everyone involved. Clearly, there was still a lot to plan and discuss at the time a donor to our endowment was originally be sought.

The Steering Committee also oversaw the development of a new funding proposal for the Real Estate Foundation, which was being finalized by a consultant hired by the College. Once the Real Estate Foundation received this proposal, it was hesitant to give its full support. The Foundation recommended that it would be more appropriate for it to fund a project of lesser value instead. It was important to the Foundation that the Institute described could work efficiently and could successfully conduct projects within the Foundation's mandate of producing results relevant to the real estate sector. Once the Institute had proven itself, the Foundation might again be receptive to a major endowment request.

In the original proposal, several projects were suggested which the Institute could initially pursue. The Real Estate Foundation was interested in a variation of one of these and invited the Institute to apply for

monies to study urban ravines in Greater Vancouver. The application was approved and in January 1992 a $56,000 project was started to create an inventory of urban ravines in the Lower Mainland and to conduct a detailed case study of one ravine to explore its value as a "hidden asset" in the community which could be used to enhance the quality of life.

FUTURE PROSPECTS

Even though funding is not yet secure, the Institute of Urban Ecology has been formally established by the College administration. It presently exists at arms-length from the rest of the College and has an assigned room but no operating fund. The Steering Committee is still in place and is discussing potential projects and the future of the Institute. A revised proposal has been written for creating an endowment which will allow the Institute to more effectively pursue funding in the future. However, other ventures are also being pursued which do not require funds. The possibilities include mounting non-credit environment courses in collaboration with the Community and Programs Services area of the College and working with non-profit organizations to establish a province-wide network to facilitate recycling in post-secondary institutions.

The Urban Ravine Project is being conducted under the Institute's name. The Project Supervisor has the benefit of an Advisory Committee, two members of which are from the community. The project is providing the Institute with publicity, thereby helping to promote it within the community. In addition to a final report on urban ravines, there will also be an open house and a public forum, all of which will be clearly identified as a joint venture of the Institute and the Real Estate Foundation.

Douglas College is the only college in British Columbia to respond to mounting public interest in the environment by forming an institute to conduct a wide range of environmental projects. Other colleges have concentrated on developing curriculum for programs in environmental technologies and environmental academic diplomas. While Douglas College does not have similar programs, they are now in development.

The experience of Douglas College has shown that colleges can assume a more active role in working directly with the community to live in greater harmony with the natural environment and enjoy a better quality of life. At the same time, the College is providing valuable work experience for its students and emphasizing how their education can provide immediate community benefit.

Centre for forestry and environmental studies

WESTVIKING COLLEGE OF APPLIED ARTS, TECHNOLOGY, AND CONTINUING EDUCATION
FISHER BUILDING - CORNER BROOK, NEWFOUNDLAND

PREPARED BY
Dr. Mike Roy
Director

INTRODUCTION

Westviking College Cornerbrook Campus had its beginning in 1963 when it opened as the Corner Brook District Vocational School. During the early years, students pursued one-year programs in the mechanical, service, business and building trades. In 1975, a two-year program was begun in Secretarial Science leading to a Diploma of Applied Arts. During the early 1980s, diploma programs were established in the aspects of business, computers and electronics.

In 1984, the **Forest Resources Technology** two-year diploma program was transferred to Corner Brook from the College of Trades and Technology in St. John's. This move was part of a larger provincial government strategy to establish Corner Brook as the provincial centre of forestry in an effort to minimize the impending closure/sale of the province's largest pulp and paper mill.

The expanded level of programming of the Corner Brook District Vocational School was recognized by the provincial government in 1985 when it redesignated the school as the Fisher Technical College. The name Fisher was selected in honour of the pioneer family of Christopher Fisher who established and operated the first major sawmill in the district.

In 1986, the Government of Newfoundland and Labrador announced a reorganization of the provincial post-secondary education system into a three-tiered system which included Memorial University, three institutes of applied arts and technology, and five community colleges. In 1987, Fisher Institute of Applied Arts and Technology was established which provided for an expanded mandate to conduct applied research and to

initiate technology transfer. In addition, an extension to the existing building was planned to accommodate the growth in student population.

In 1989, the provincial government announced its intention to restructure the post-secondary education system once again. An Act was proclaimed in 1992 establishing a two-tiered system which included Memorial University and five Regional Colleges of Applied Arts, Technology, and Continuing Education (hence Fisher Institute, based in Cornerbrook, and Western Community College were combined to form Westviking College of Applied Arts, Technology and Continuing Education).

COURSE HISTORY

In Newfoundland and Labrador, the need for integrated resource management has been recognized for more than three decades. Yet the application of the philosophy of sustainable development and the principles of integrated resource management remain complex and elusive. Clearly, any lasting solutions require the input and action of each sector of society.

The concept for a specialized centre of natural resources began crystallizing after the transfer in 1984 of the Forest Resources Technology program from St. John's to Corner Brook. This transfer included all of the first-year forestry students and the four forestry instructors. The principal at the time was interested in exploring other land-based options such as agriculture.

With the government announcement, in 1986, of the expanded mandate into applied research and technology transfer, one of the forestry instructors took a sabbatical leave to pursue doctoral studies focusing on the role of post-secondary education in integrated resource management and environmental policy, with the view to assist the College in the development of its new mandate.

With the appointment of a new president and new board of governors in late 1987 and early 1988 respectively, an ambitious planning process was started which included a variety of internal and external discussions with respect to a unique provincial niche for the Institute. An internal curriculum assessment and a long-term development plan prepared by a consulting company resulted in recommendations for the creation of a centre for natural resources and environment.

In 1989, the president, with support from the Department of Education's initiatives fund, seconded the returning instructor to conduct a feasibility study for a specialized centre within the Institute. This research included personal visits to most of the educational institutions in Atlantic Canada involved in any aspect of land-based renewable resources and environment. It also included a review of many related programs offered in Canadian colleges and technical institutes.

His report formed the basis for internal and external discussions and the subsequent recommendation to establish the Centre for Forestry and Environmental Studies (CFES) was approved by the Board of Governors in March 1990.

On October 16 and 17, 1990, Fisher Institute in partnership with Corner Brook Pulp and Paper cosponsored a seminar to validate the proposal to establish CFES. The participants of the two-day seminar consisted of six distinguished academics from British Columbia, Alberta, Ontario, Quebec, New Brunswick and Nova Scotia, along with 22 senior executives from Newfoundland land-based industries and government departments.

The validation process confirmed the need for such a Centre within the higher education system in Newfoundland. It was generally acknowledged that, although the renewable land-based sectors comprise a significant part of the provincial economy, there had been a substantial void in terms of a concomitant educational support system. Therefore, in this light the CFES mission was seen as timely.

THE CENTRE FOR FORESTRY AND ENVIRONMENTAL STUDIES

The mission of the Centre for Forestry and Environmental Studies (CFES) is:

> to provide human resource development offerings and to participate in technology transfer efforts in support of sustainable development of the province's land-based renewable resources and environment.

The two-fold focus of human resource development and technology transfer is aimed primarily at technical and professional clientele in the public and private sectors of forestry, wildlife, agriculture, parks and adventure tourism, landscape management, conservation enforcement, geomatics and environment.

CFES works closely with partners in the public and private sectors to identify and implement a variety of human resource development activities. These range from short courses, workshops, seminars, symposiums, and student and faculty exchanges, to the development of three-year diploma programs.

Technology transfer is defined as the dissemination of scientific knowledge and application of existing technology to specific problems. The National Research Council supports this aspect of the CFES mission through its Industrial Research Assistance Program. CFES is prepared to work with clients through all phases of the technology transfer process.

The activities of the Centre are guided by the general philosophy of environmentally sustainable economic development. It adheres to the edict of "think globally, act locally" by adopting and adapting state of the art knowledge and technology to local problems. In addition to this general framework, a number of the following features help define the approach of the Centre:

1. **CFES is a catalyst:** It works actively with individuals and organizations to identify and seek solutions to critical problems.

2. **CFES responds to client needs:** It recognizes that the application of knowledge, otherwise known as technology transfer, can most effectively take place by responding to specific needs that are client driven.

3. **CFES operates through a network-of-excellence:** It has sought to establish links and bridges with relevant provincial, national and international expertise. This approach encourages collaboration with, rather than competition and duplication of, existing infrastructures. It is a cost-effective way to ensure state-of-the-art knowledge and technology.

4. **CFES is a bridge:** It serves as a conduit between provincial colleges, the university, private industry and government agencies. CFES staff tap into existing facilities and personnel from the network on a collaborative, contractual or secondment basis depending on the specific conditions of a given project.

5. **CFES is strategically located:** Western Newfoundland has two World Heritage Sites and natural scenery unparalleled anywhere in eastern North America. The region has a substantial infrastructure for

the development of human resources for land resources. Corner Brook is Newfoundland's "second city" with a metropolitan population of approximately 35,000. It is a sheltered seaport with a large pulp and paper mill. The Sir Wilfred Grenfell College, a campus of Memorial University, includes a four-year Fine Arts degree program and plans to introduce a four-year degree in Environmental Science. In addition, the provincial government's forestry headquarters is located in Corner Brook and there is a four season ski resort nearby.

6. **CFES is non-profit:** It operates on a cost-recovery basis. It does not accept work that can be done for profit by existing consultants and businesses.

Related faculties within Westviking College include Forest Resources Technology, Environmental Technology, Civil Engineering Technology, Electronics Engineering Technology, Mineral Technology, Computer Programming and Business Administration.

ACTIVITIES Considerable progress has been made, since the official validation, to advance the mission of the Centre. Many of the specific activities have focused on establishing a working network. What follows is a list of selected activities the Centre has been involved with:

International Activities

1. At the international level, CFES has been building upon the foundation provided by the Director's Ph.D. dissertation which examined the relationship of the higher education system to the development and implementation of sustainable development policy. Specifically, the thesis compares Newfoundland as a peripheral jurisdiction in Canada to Tasmania and Alaska which are peripheral to Australia and the United States. This foundation has enabled CFES to participate in a number of international forums relevant to sustainable development of the environment. For instance, the thesis research provided the basis for a paper entitled, "Shaping a World Agenda for Education and Forests," presented to and published by the 10th World Forestry Congress in Paris in 1991. This important congress paid considerable attention to examining and prioritizing the forest issues to be discussed at the Earth Summit in Brazil. As might be expected, education and communication were given some prominence.

2. The Centre participated in the GLOBE 92 Conference and Trade Fair in Vancouver. GLOBE is an acronym for "Global Opportunities for Business and the Environment." This forum widened the CFES network and provided a glimpse of the state of the art in environmental technology being used around the world.

3. Another highlight was the participation in "Educating Forest Technicians into the 21st Century," the international conference held at Paul Smith's College in New York.

4. CFES will present a paper addressing the need to develop an appropriate conceptual framework for higher education and sustainable development at ECO-ED, the World Congress for Education and Communication on Environment and Development in Toronto. The paper will also explore the potential benefits of reforming a number of professional schools related to the land-based environment.

National Activities

1. Among the more exciting national initiatives was a 1991 student-faculty exchange between the forest resources technology programs of Malaspina College in British Columbia and our program in Corner Brook. Participants from both ends of the country were equally impressed at the diversity yet similarity of cultural and environmental issues in each province. This exchange was made possible through the ACCC and the Secretary of State.

2. The Centre has been invited to participate in a number of national forums such as the one held by the National Table on the Environment and the Economy in Halifax which examined national education initiatives and the ACCC's 1991 Environment Consultation. In addition, CFES was invited to present a paper by the Lakehead University Forestry Association at the Symposium on Community Forestry. As a result of these activities, numerous contacts, visits and linkages have been established with college and university programs throughout the country.

Local Activities

1. Building on the international and national networks established to date, the Centre is making steady progress towards applying the phi-

losophy of "think globally, act locally." In this regard, it has been a catalyst and support system for a number of projects. These include presenting briefs to the Task Force on Agrifoods and the Strategic Economic Plan. As well, CFES was requested to develop the leadership training program for the Newfoundland Youth Conservation Corps and has been developing several new diploma programs such as eco-tourism/adventure tourism and conservation enforcement. The Centre has also assisted development associations, community futures groups, native organizations, environmental groups, and participated actively in the professional and scientific community.

2. The National Research Council Industrial Research Assistance Program (NRC-IRAP) has been of particular assistance in pairing College expertise to industrial problems as they relate to sustainable development. Altogether, more than 300 companies have been reached through the NRC-IRAP contribution agreement with CFES.

   For example, the NRC-IRAP contribution agreement has enabled the Centre to conduct a comprehensive review of the educational and technology needs of the environment sector in Newfoundland and Labrador. The results of this survey will help refine the College's Environmental Technology Diploma Program which is presently being offered in cooperation with the University College of Cape Breton. The survey results are also assisting CFES in the design and delivery of relevant professional development courses for environmental technologists and managers. And finally, the data collected provides some college-wide direction for technology transfer projects with member companies of the Newfoundland Environmental Industries Association.

   Other NRC-IRAP supported projects include a workshop series and symposium for the landscape ecology sector. This initiative resulted in the formation of a landscape industry association and a proposal for a joint diploma program with the Nova Scotia Agricultural College. Also of major importance was the completion of a comprehensive needs assessment concerning the present status and future directions of geographical information systems technology in the province. Based on this work, CFES has offered a short course and workshop on GIS and global positioning systems. GIS is considered to be seminal technology for sorting out difficult integrated resource management issues.

3. The Green Plan-Model Forest Initiative is another significant project which CFES is involved in. The Centre is a partner on the Western

Newfoundland Model Forest which is one of the ten model forests to be established in Canada. As announced by Prime Minister Mulroney at the Earth Summit, three more model forests, supported by Canada's Green Plan fund, will be established in developing countries.

FUTURE ASPIRATIONS

CFES is a concept whose time has come. It has risen and survived in the face of a major recession and the associated restraints, cutbacks, layoffs and minimal short-term funding. As well, the concept has stood the test of time. The concept has lived on and been adopted by three CEO's as a flagship. This survival is possible partly because CFES has adopted a network-of-excellence operational style that stresses internal and external collaboration. But the prevailing reason for any success is that CFES is serving a real need for a major part of the provincial economy. It is striving to serve a substantial technical and professional clientele involved in all aspects of land-based renewable resources and environment.

Nevertheless, CFES is breaking new ground and every new idea is a hard sell. This is all the more challenging since the entire post-secondary system in Newfoundland is in the midst of a major restucturing and amalgamation of once autonomous institutions. However, there is every indication that CFES will survive, if not thrive, in the period of change and uncertainty.

CFES is in the process of encouraging the concept of the "Green College" as advocated by ACCC. This will provide a uniting focus in which to continue the work of linking internal college resources to real world problems. In this regard, the Technology Transfer Committee has the potential to serve as a useful forum to coordiante the transition from a conventional college to one that is "green."

During the coming years, CFES will build on the detailed needs assessments that have been done for environmental technology, landscape ecology and geographic information systems. At present, this is a challenge, but one that can be met.

A CFES Advisory Board consisting of eight to ten individuals will be established in the near future to provide advice on Centre priorities and direction. The membership will reflect the integrated resource management focus of CFES by consisting of senior representatives from a variety of renewable resource and environment sectors. The Board will have

provincial and national representation from private industry, government and academia.

Perhaps the greatest challenge faced by CFES will be to meet the expectations that have been raised within the province. The Centre has a firm foundation built on many years of planning and research. The aim now is to deliver. This will require continued creativity and personal commitment.

Environmental management tools in a tailor-made training context

CENTRE DE FORMATION EN ENVIRONNEMENT INC. (ENVIRONMENTAL TRAINING CENTRE)
CÉGEP DE SAINT-JÉROME - -SAINT-JÉROME, QUÉBEC

PREPARED BY
Jocelyn Benoit
(former) Director

INTRODUCTION

The goal of Centre de formation en environnement inc. is to meet the training needs of those industries wishing to integrate an environmental dimension into the development of their training tools. The Centre offers its industrial clientele training specifically adapted to the needs and the organizational culture of enterprise.

The tailor-made training offered by the Centre for Environmental Training Inc. can take place at the industrial project or product development stage as well as at the production and operations management stage.

CUSTOM-DESIGNED TRAINING SERVICES OFFERED BY CENTRE DE FORMATION EN ENVIRONNEMENT INC.

Custom-designed training can be provided at a company's request for groups of individuals taking part in training activities designed to help them transfer acquired skills to their work situation. Training activities are geared to identified needs and generally fall within the framework of upgrading professional skills and helping workers adapt to technological or organizational change.

The Environmental Training Centre's framework for intervention is based on a number of principles designed to guarantee a quality intervention:

Making Use of Partners' Individual Skills . Training agreements are entered into as a partnership, with each partner maintaining its own field of expertise: i.e. the business has the best understanding of its organizational culture, goals, orientations and needs while the Centre has exper-

tise in translating needs into training objectives and training content.

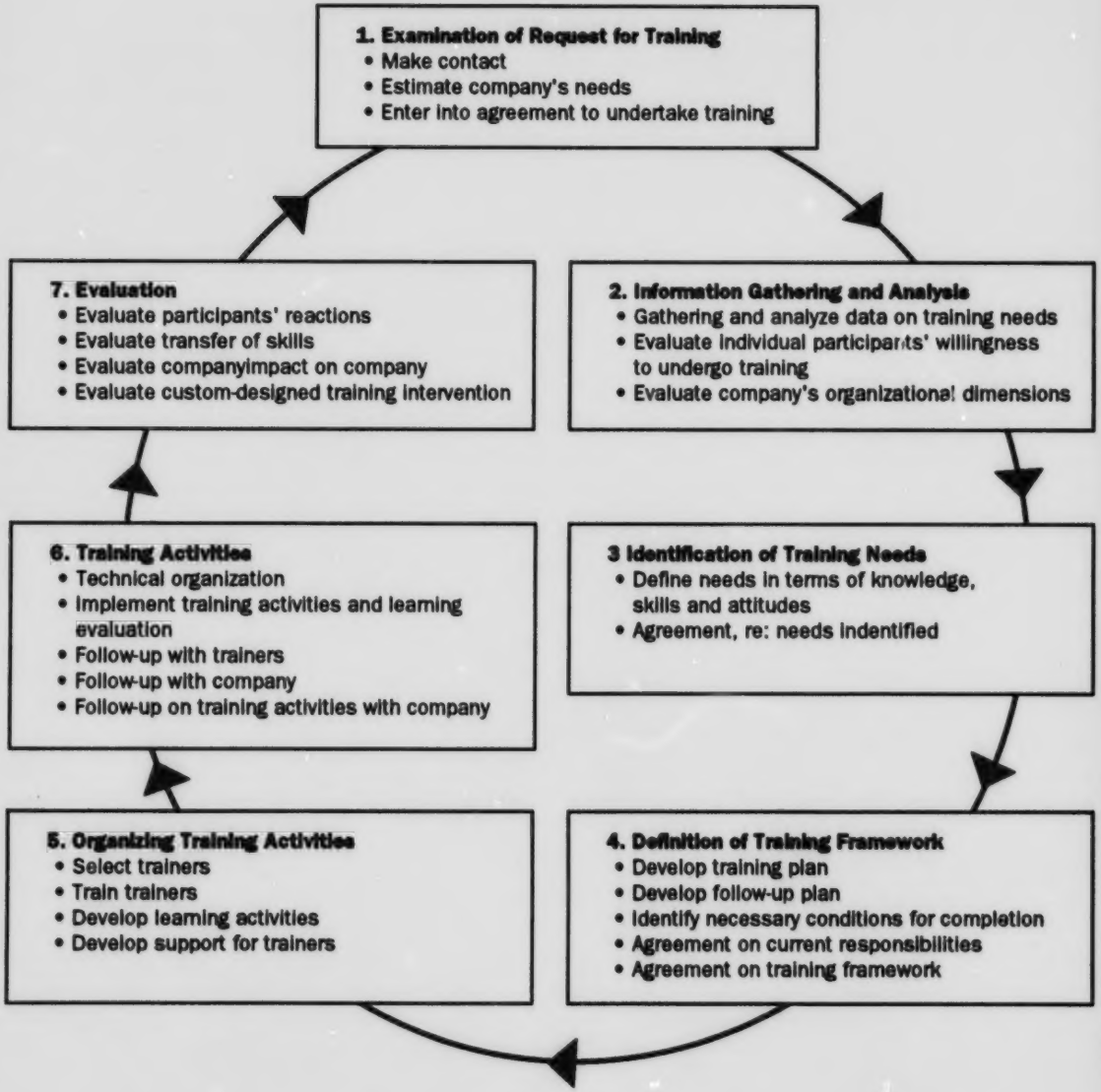
Responding to the Needs of the Client . Training requests are designed to meet certain human resource development needs which are generally defined on the basis of its goals as a business. In preparing the program and training activities, the Centre also gives consideration to the needs of individual participants.

Training as Support for Organizational Development . Personnel training is one important way in which organizations can grow. Informing the client of the potential as well as the limitations of training programs is also part of the services offered by the Centre.

Training: A Shared Responsibility . The Centre recognizes that success in custom-designed training depends on the full participation of all partners: the Environmental Training Centre, the business and the trainees themselves. Because the element of cooperation amongs partners is indispensable throughout the process, it is necessary that mechanisms for cooperation, as well as formal and informal communication networks, be in place from the very start.

Transferring Skills: The Key to the Training Process . The Centre believes that transferring acquired skills to the workplace is the ultimate goal of custom-designed training. By maintaining this goal as foremost at all times, it is translated into concrete interventions at each stage of the process.

The Intervention Process in Tailor-Made Training: Steps and Operations . The following table illustrates our intervention process for custom -designed training. This process is based on existing models as well as our own practical experience:


1. Examination of Request for Training
• Make contact
• Estimate company's needs
• Enter into agreement to undertake training
2. Information Gathering and Analysis
• Gathering and analyze data on training needs
• Evaluate individual participants' willingness to undergo training
• Evaluate company's organizational dimensions
3 Identification of Training Needs
• Define needs in terms of knowledge, skills and attitudes
• Agreement, re: needs indentified
4. Definition of Training Framework
• Develop training plan
• Develop follow-up plan
• Identify necessary conditions for completion
• Agreement on current responsibilities
• Agreement on training framework
5. Organizing Training Activities
• Select trainers
• Train trainers
• Develop learning activities
• Develop support for trainers
6. Training Activities
• Technical organization
• Implement training activities and learning evaluation
• Follow-up with trainers
• Follow-up with company
• Follow-up on training activities with company
7. Evaluation
• Evaluate participants' reactions
• Evaluate transfer of skills
• Evaluate companyimpact on company
• Evaluate custom-designed training intervention

Main clients of Centre de Formation en environnement

Association des industries forestières du Québec(Quebec Association of Forest Industries)

Centre de développement des Laurentides (Laurentides Region Development Centre)

CRSSS - Laurentides-Lanaudière Region

CRSSS - Québec Region

Gaz Métropolitain Inc.

Kenworth Canada

James Maclaren Inc.

Ministry fo Cultural Affairs

Environment Canada

Municipality of Asbestos

Municipality of Montmagny

Municipality of Prévost

Municipality of Saint-Antoine

Regional municipalities of Mirabel

Regional municipalities of Thérèse-de-Blainville

Radio-Québec

ALCAN

Trustco Desjardins

Union des municipalités régionales de comtés du Québec
(Quebec Association of Regional Municipalities of Counties)

Union québécoise de la conservation de la nature

CHAPTER 4

TOOLS

Energy Conserving Measures Taken at

SIR SANDFORD FLEMING COLLEGE - PETERBOROUGH, ONTARIO

PREPARED BY
Carm Clark
Plant and Property Supervisor

INTRODUCTION

In recent years, the cost of electrical heating and air conditioning at Sir Sandford Fleming College (SSFC) has increased significantly greater than inflation. There has also been a realization that the environmental impact of additional nuclear, coal and water powered stations poses a real threat to our environment. The most effective means to minimize this threat is through the reduction of usage.

Sir Sandford Fleming College has audited and taken action to reduce energy consumption for conservation and budgetary reasons. This has resulted in real dollar savings and energy usage reductions in a short period of time, while increasing lighting facility usage. Concrete actions are outlined.

Ontario Hydro has also recognized this fact and provided experimental and renovation incentives. The plant and property staff of Fleming have taken an active role in attempting to reduce usage. This report outlines actions taken and results obtained.

ACTIONS TAKEN

The College, in concert with the Ontario Hydro, did an energy audit of its Brealey and Frost facilities. This resulted in many concrete suggestions accompanied by estimated costs of projects and payback period. The College decided in mid-1989 to do all projects that had a year payback period and to proceed with others as resources came available both internally and externally. The plant staff took an active leadership role in identifying additional cost saving actions.

Actions Taken To Date with Results

1. **Re-Lamping:** Installed 3.916 energy reducers in fluorescent fixtures (30% gain) at cost of $83,000, with Hydro incentive of $30,000. Return on investment in 14 months.

2. **Windows:** Film installed in cafeteria and student lounge at cost of $8,000. Hydro incentive of $1,600. Reduction of hydro by 20% return on investment in one year.

3. **Re-Lamping of Cafeteria, Pub, Servery:** At $16,500 with compact fluorescent fixtures for a hydro reduction of 80%. Ontario Hydro incentive grant of $5,400.

4. **Exterior Lamps:** Converted 12 outside electrical lights to high pressure sodium fixtures plus added three additional fixtures at a cost of $25,000. Increased lighting yet reduced costs in same year.

5. **Thermostats:** Installed thermostatic controls on all outside rooftop air conditioning units at a cost of $2,000, resulting in a 20% savings recouped in one year.

6. **Pool Lighting:** Installed compact fluorescent fixtures on pool deck area at an estimated cost of $4,500 with an expected savings of 80% and Ontario Hydro incentive of $2,000. Converted from 80 - 150 watt bulbs to 18 watt compacts.

7. **Exterior Globe Lights:** Converted from 300 watt incandescent to 50 watt high pressure sodium at an estimated cost of $1,800 with 50% hydro grant.

PROJECTS UNDER CONSIDERATION

1. **Classroom Motion Sensors:** After having piloted two classrooms with motion sensors and proving system and major cost reductions, we are now going to convert 84 classrooms and labs at one campus to motion sensors costing $32,000 minus a hydro grant of $10,100. The projected payback is seven months.

RESULTS

The hydro strategies engaged in by staff since 1986 at our Brealey facility have resulted in reducing annual consumption by over 1,000,000 KWH

or in a savings of $56,000 per annum at today's rate (see graph). The reductions are in fact greater than this since the College has brought onstream approximately 400 computer terminals, added electrical apprentice shops, increased safety lighting and increased student population by approximately 30%.

Perhaps one of the most important results is that the staff believe they can reduce costs through their insights and actions.

SUCCESS FACTORS

The primary reasons for the success were:

1. A conscientious plant and property staff who were not afraid to take action.
2. A management team who were willing to take risks.
3. An empowered staff who had problem solving skills to do proper analysis.
4. Availability of incentive grants to reduce costs.
5. A climate that contained a real threat yet an opportunity.
6. Availability of technical advisors and actual technical breakthrough devices.
7. Flexible budgeting process that allowed implementation over multiple budget years without penalizing risk takers.

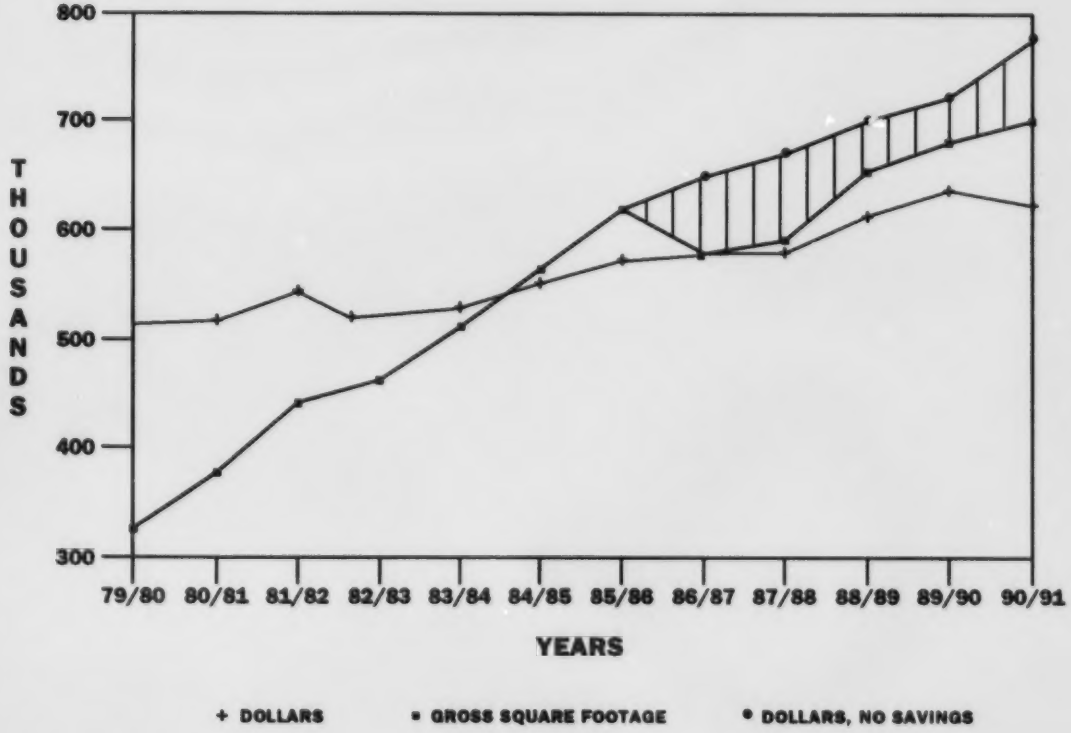
BARRIERS

1. Need for greater financial resources to tackle bigger projects.
2. Usual scepticism by needed support groups.
3. No previous proven track record.

THE FUTURE

Having experienced success both in energy reduction for conservation reasons and budgetary reasons, we are now searching out all possible alternative methods including major conversion from hydro to natural gas for heating and air conditioning.

S.S.F.C. Enery Profile



President's advisory committee monitoring our responsibilities to the environment

THE NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY - EDMONTON, ALBERTA
FINAL REPORT 27 MARCH 1990

SUBMITTED BY
PACMORE TASK FORCE

INTRODUCTION

The President's Advisory Committee Monitoring Our Responsabilities to the Environment (PACMORE) Task Force was charged with the reponsibility of examining how NAIT is responding to the environment and how NAIT could further enhance its contribution to the environment.

Section A of the report has examined the practices presently in place and noted the positive impact of these practices on the environment.

Section B of the report examined environmental issues of concern raised by staff, students and the Task Force members. It contains recommendations and objectives to be achieved in order to further enhance NAIT's contribution to the environment.

PACMORE Final Report: March 27, 1990

A. The requirement to "inventory and report on what NAIT is presently doing by way of improving the environment" has been completed. This report presents the details of this study.

Accessibility Facilities Management, with guidance from and in cooperation with Service to Disabled Students, now routinely examines all projects and renovations to increase the accessibility of the area involved to the disabled.

Asbestos In 1981 the majority of asbestos insulation was removed from NAIT buildings by Alberta Public Works. In areas where asbestos insulation is located in air plenums, and did not pose a risk, an encapsulation treatment was applied.

Drinking Water All tests were negative (lead did not exceed city water levels). Tests are being conducted on a zero lead content solder for use on plumbing lines.

Ergonomics NAIT Facilities Planning maintains an acute awareness through resource information, contact and feedback from staff, and the practice of borrowing new products for demonstration purposes.

Primary implementation focus has been on the selection of furnishing which suits the job descriptions of the users (both staff and students).

Hazardous Waste Disposal In heavy areas (Chemistry, Biology, etc.) critical wastes are separated and stored in fume cabinets until disposal is made by approved methods and agencies. The Safety Office is contacted by small generators of hazardous material for its safe disposal. Arrangements are made by them for safe storage in the Chemistry Department prior to disposal. Approximately four times per year, the technicians from Chemistry collect all of these wastes which are then picked up and disposed of by the University of Alberta. The University of Alberta and other agencies (Edmonton Ambulance Authority, Alberta Government Veterinarian Lab) have been licensed as disposal agencies. NAIT's waste material is disposed of by them as follows:

- organic waste is disposed of by incineration or neutralization.
- inorganic waste is disposed of by incineration or microwave neutralization.
- radioactive waste is stored separately and
- disposed of as per the Atomic Energy Act.
- heavy metals are disposed of in a deep well.

NAIT contracts for these services and the costs are charged back to the cost centre.

Sharps (needles, scalpels, lancets, etc.) and medical contaminants are disposed of through the local area hospitals and the Edmonton Ambulance Authority.

All wastes from large generators, other than laboratories, are disposed of by the Safety Department through commercial disposal firms.

Some hazardous wastes (e.g. PCBs) are stored by the department concerned until sufficient amounts are accumulated, institute wide, to justify a shipment to Swan Hills.

Ventilation and Air Conditioning (HVAC)

Most buildings and systems are capable of delivering adequate amounts of outside air as well as adequate air change rates. Interior environment is examined on an as needed basis.

Potentially hazardous situations are assessed by taking air samples for analysis by an independent testing laboratory.

The causes of environmental problems at NAIT are very typical of those found elsewhere in institutions and commercial buildings. Such causes include:

1. revisions to partitioning and occupancy without making accommodations in the HVAC systems.
2. changes to space use without attendant changes to the HVAC systems.
3. energy conservation designs and retrofits that frequently reduce outside air flow.
4. poor design. In some instances at NAIT, obsolete technology rather than poor design causes problems as, for example, the use of unit ventilators for workplace classrooms.

The renovation procedures now followed by management recognize these causes and prevent their occurrence.

Aircraft and vehicle exhaust fumes have been an annoyance to the Business Centre occupants. The problem is currently being addressed by the planned relocation of the air intakes to roof level.

Lighting Designers and consultants of renovation projects are directed by Facilities Planning to provide lighting levels to the standards published by the Illuminating Engineering Society. The benefits of natural lighting are also recognized. Towards this end, renovation projects have been planned to move officebanks out of basement spaces and provide for "borrowed" natural lighting to interior rooms through sidelights. Low energy fluorescent tubes and ballasts are being specified and installed. Lighting levels at secretarial/clerical work stations having video display terminals were measured in 1985 and the minimum standards were met or exceeded.

Microwave Leakage The Safety Office tests an average of one microwave oven per month at the request of individual departments. Only on one occasion was leakage present and corrective action was implemented.

Mercury Each area is responsible for cleanup of minor mercury spills according to W.H.M.I.S. requirement. Equipment is available through the Safety Office for cleanup of major spills.

Noise The Safety Office with the co-operation of Health Services conducts audiometric surveys upon request. Where sound levels exceed acceptable standards, modifications involving sound attenuation or shielding are performed.

Radiation NAIT has eight licensed users of radioactive material. These eight areas represent approximately ninety percent of all use at the Institute and they return all waste material to their supplier. Casual users arrange for disposal through the Safety Office which disposes of the material through the University of Alberta.

Radon Gas The Edmonton area has been identified as a low risk area for radon gas. One test was conducted in 1986 on the Engineering Technologies Annex with acceptable results for radon concentrations.

Smoking
Video Terminals
Workplace Hazardous Materials Information Systems (W.H..M.I.S.) The Health and Safety Committee is the group designated to gather information on smoking concerns. This committee makes recommendations to the President on designated and non smoking areas. NAIT has implemented a restricted smoking policy limiting the areas within the Institute where smoking is permitted. This action has significantly reduced the problem of second hand smoke in the workplace.

Video Terminals

All V.D.T. (Video Display Terminals) are tested annually for ionizing radiation emissions. To date no unacceptable levels have been detected in NAIT.

Workplace Hazardous Materials Information Systems (W.H..M.I.S.)

The W.H.M.I.S. program and standards are in the process of being implemented at NAIT. Presently, generic training has been completed for 1,800 employees. This process is ongoing and continuous. Over 75 W.H.M.I.S. trainers have been trained to date. The critical areas of Chemistry, Medical Lab, Bio Sciences, Autobody and Photography have completed the worksite specific training. The balance of the areas are scheduled for completion in the fall of 1990.

B. The requirement to determine what NAIT could do to improve or contribute to a safe environment has resulted in several recommendations.

The PACMORE Task Force reviewed a total of 41 suggestions (Appendix A) regarding areas where NAIT could make an enhance contribution to the environment. These suggestions were received as a result of canvassing the Task Force members and in response to notices placed in NAIT-LINE and THE NUGGET. The issues that fell within the mandate of the Task Force are distilled into six major concern groups and are identified with their accompanying recommendations below. The Task Force did not address issues outside its mandate.

Awareness Campaign

A number of suggestions identified the need for an awareness campaign to make people conscious of environmental issues and products. Increased awareness of the concerns would sensitize NAIT's staff and students to environmental issues within the Institute and to the effects of thes issues on our community at large.

Part of the awareness campaign should concern itself with appropriate signs to encourage the recycling, reuse and reduction of material presently consumed at NAIT. The committee felt there was a need for a personal commitment and responsibility on the part of staff and students to ensure that NAIT maintains a positive image within the community.

Internal communications were considered to be an environmental issue. Improved coordination of publications should be investigated.

The Task Force suggests that the Deans and Program Heads should take responsibility, as part of their course review, to check for course content concerning environmental issues. If environmental issues are relevant to the program being reviewed, they should be incorporated into the course content.

Recommendation

OBJECTIVE: Raise awareness and sensitize staff and students to environmental concerns and reduce the amount of garbage at NAIT.

1. Introduce an environmental awareness program for staff and students. Highlight areas where such a program would have a demonstrable effect on our internal operation. An increased awareness by NAIT staff and students in co-operation with the Northern Alberta Institute of Technology's Students Association (NAITSA) would enhance the Institute's environmental response.

   Part of this campaign should be the greater coordination of internal publications and an investigation of the increased use of electronic communications resulting in reduction in paper wastage.

   A signage program should be developed for the awareness program and should be done in co-operation with NAITSA.

   The success of this program should demonstrate a change in the present behaviour to one that is increasingly more friendly to the environment.

Facilities Management

The PACMORE study revealed that Facilities Management has been quite innovative in their approach to environmental concerns. A number of procedures they instituted have been in palce for some time and are environmentally-sound procedures. They have been quietly working in the background to ensure that NAIT's facilities are as environmentally friendly as possible given the constraints of time, space and funds. It is to their credit that they achieved this level of consciousness some time ago. A number of environmental concerns and issues that face us fall naturally within the mission of the Safety Office. Some further issues that have been identified for the Facilities Engineering are:

1. Power Engineering boiler lab and the Institute power plant - Their tack glasses and waste chemicals.

2. Freon and halon systems:
   The freon in the operation of refrigeration systems and the halon used in the fire prevention systems both have an oxygen depletion effect on the environment if vented into the atmosphere.

3. Hazardous material and hazardous waste disposal:
   These items have a strong potential to cause environmental damage. All parties have to be constantly vigilant in this area to ensure that these items are handled in the best possible manner and disposed of using established systems.

4. Maintenance concerns within the Institute:
   Although these factors were not unknown to Facilities Management, they should maintain an awareness of these concerns and attempt to remedy any potential envi-ronmental problems when repairing or rebuilding the facilities.

5. The NAITRIUM,
   Dock and area, B104E and Cafetorium: A number of observations were made on excessive smoke emanating from these particular areas.

6. Phosphate Soap:
   Many different types of soap are available on the market. Facilities maintenance staff should be conscious of the different aspects that waste soap water can have on the environment. This concern is also applicable to Food Services, etc.

7. Ventilation:
   Some points were made over the concern and adequacy in the Chemistry Lab and Preparation Area, the MET Lab, the Mechanical Technologies building, the Engineering Technologies Annex, A272, A170, Hairstyling, and the F Wing. Most of these areas are part of the original construction of the Institute and the systems presently in place may not be up to current standards.

Recommendations

OBJECTIVE: To enhance existing procedures that protect the environment.

1. In co-operation with Facilities Management, the program areas should

provide monitoring equipment as part of any renovations for the boiler lab, stack glasses and the handling of waste chemicals. Program areas must comply with the W.H.M.I.S. requirements. Further information on these standards can be provided by the Safety Office.

2. Facilities Engineering should ensure that updated technology is used when replacing any freon-operated refrigeration system. The replacement of halon systems should be an ongoing matter and Facilities Engineering should continue to investigate alternative uses of halon.

3. Disposal of hazardous wastes and hazardous materials should comply with W.H.M.I.S. regulations. Disposal procedures are in place and must be followed by the user areas. The Safety Office should review all data submitted by the Associate Deans as part of this study, and identify and remedy any unforeseen problems in this area.

4. Any recommendations to enhance the environment through maintnance procedures should be referred directly to Facilities Management for evaluation and implementation.

5. Concerns regarding designated smoking areas should be forwarded to the Health and Safety Committee for review and any recommendationsforwarded to the President. It was not considered a mandate of the PACMORE Task Force to become involved in the smoking issue.

6. The type of soap in use at NAIT should be investigated jointly by Materials Management, the Safety Office and Facilities Management. The objective would be to use the best possible soap for the job with the lowest phosphate level in order to further avoid damaging the environment.

Food Services

A number of concerns were received regarding the operation of Food Services at NAIT. They are:

1. Condiment packaging: This concern was addressed several times.

2. Cutlery: The elimination of disposable items such as plastic knives, forks, spoons, and styrofoam dishes and products was suggested.

3. Lack of opportunity to purchase food items on china dishes.

4. The use of Chloro-Flouro-Carbon (CFC) products such as styrofoam plates, cups, bowls, etc. Two issues of concern about use of CFCs were expressed. They were:

   a. Do the styrofoam products at NAIT contain CFCs?

   b. What effect on the environment do they have after disposal?

   It was determined that the styrofoam products utilized by Food Services do not contain CFCs.

5. The lack of opportunity for staff to purchase coffee in their own mugs. This issue was perhaps one of the major items to come to our attention.

Recommendations

OBJECTIVE: Reduce the amount of garbage and non-biodegradable landfill generated by the patrons of Food Services.

1. Landfill Alternatives:

   a. Food Services should investigate the use of condiment packaging in an attempt to find an alternate means of distribution.

   b. Disposable cutlery should be eliminated as much as possible.

   c. An alternate means should be found to dispense food items other than in styrofoam products. Greater use of existing chinaware should be encouraged.

   d. Supplies purchased for Food Services should be biodegradable or paper products where possible.

2. Personal Coffee Mug:

   a. Initiate a pilot project whereby people could purchase coffee in a standardized reusable coffee mug. This pilot project may take the form of a standardized plastic mug presently available on the market and could be used a spart of the awareness campaign or fundraising project. A method to monitor the use of the mug should be instituted. This method could take the form of a special key on the cash register.

Paper Products

The high volume of waste paper disposed of at NAIT may have precipitated the whole environmental question within the Institute. Wastage and disposal were identified a number of times and seem to be the most visible point of concern.

The Purchasing Department investigated the cost of recycled paper and advised that the cost premiums do not warrant the acquisition of recycled paper at this time. The question, therefore, is one of reducing the amount of paper that is consumed in the Institute and the recycling of waste paper.

Regarding paper consumption at NAIT, it would appear that one of the highest areas of waste is the use of computer paper and the minimum amount of information placed on each sheet. Computer printers are very wasteful when it comes to making full use of the space available on a sheet of paper.

The use of paper towels was also highlighted and suggestions were made regarding increased use of linen or electric hand dryers. However, both of these items cost more and increase the labour component of the operation. The use of unbleached paper was also identified as a replacement for existing paper products in washrooms.

Recommendations

OBJECTIVE: Reduce the amount of paper consumed at NAIT.

1. Encourage double-sided duplicating and printing.
2. A pilot project on recycling paper should be carried out in conjunction with Facilities Management, Custodial Services and Materials Management. This project should involve the academic staff and operate out of the Business Centre. Computer Systems Technology and Information Systems Division were suggested target areas.
3. Single sheet paper towel dispensers should continue to be replaced gradually with lever activated roll paper towel dispensers wherever possible. This action would cut down on the amount of paper towels used at NAIT.
4. Custodial services should investigate the use, where possible, of unbleached paper products for washrooms.

5. Computer users should be encouraged to match paper size with print area requirements.

Newsprint Wastage

A high volume of newprint material is brought into the Institute on a daily basis largely because of commerical distribution boxes located on NAIT property and close to entrances. The student newspaper also distributes newsprint material.

Recommendation

OBJECTIVE: Reduce the consumption of newprint and provide for its disposal.

1. Limit the number of commercial newsprint box dispensers on NAIT property. Request NAITSA to investigate the quantity of the NUGGET printed versus the quantity left over.

Pop Can Disposal

A high volume of aluminum pop cans is generated by consumption of beverages on the NAIT Campus. Recycling of this high profile item could be a useful part of an awareness campaign. Student involvement could be enhanced by this opportunity to participate in a recycling procedure.

Recommendation

OBJECTIVE: Recycle aluminum beverage cans.

1. NAITSA should investigate the possibility of instituting a recyling program for aluminum cans. The funds thus generated would be returned to NAITSA.

Environmental advocacy roles for the professional educator

The experience of Arctic College's RRTP has proven that it is possible for professional educators to create opportunities for effective environmental advocacy. The following is a number of suggested advocacy roles:

1. **Curriculum Design/Student Projects:**
   Perhaps the most effective way of instilling an environmental ethic in students is to keep returning to the concept of environment in a variety of contexts, i.e. develop environmental math modules, environmental cooking, environmental history, environmental mechanics, etc.

   Students can be effective advocates for the environment by being active questioners. Turning students loose with a bag full of questions can stimulate a lot of environmental thinking because the decision-makers and bureaucrats to whom they are asking the questions really want to be able to give them good answers.

2. **Consulting:**
   In many college/institute communities, there is a shortage of professionally trained communicators available at low cost to help community groups formulate and express their opinion on environmental issues. As consultants to these groups, college/institute staff can be a valuable community asset by contributing their professional networks and training to help communicate a local position.

3. **Research:**
   In many college/institute communities, outside researchers come in to do studies and then return to their parent institution to write their reports, leaving local residents unaware of their presence and less aware of their findings. Colleges/institutes can play a critical role in bridging the knowledge gap between local people and researchers. They can also provide a valuable support service to researchers who don't know the lay of the land, local politics, availability of logistical support, local history, etc.

   Because of their academic training, it is sometimes possible for col-

lege/institute staff to take on their own research programs, which helps staff to remain current in their field as well as providing students with opportunities to become involved in real field work, which develops direct link between the local community and the research community.

4. **Public Involvement:**
   As environmental impact assessment capabilities mature, it is likely that more development issues will be subjected to public review. College and institute staff will be well placed to assist other groups through various consulting arrangements to answer specific questions through local research networks and to contribute their opinions directly to the debate. Because they have the skills to be good communicators and hold a practical and local perspective, they are likely to be credible intervenors in public hearings.

5. **Co-Management:**
   In the North, as the result of aboriginal land claim negotiations backed up by recent court decisions, a host of co-management institutions has arisen to provide govern nents with direct local input in management decision-making. Often these boards are made up of nominees put forward by aboriginal user groups and nominees put forward by government. College and institute staff can be particularly effective co-management board members because they are familiar and comfortable with bureaucratic and collegial modes of decision-making, and are also comfortable and sensitive to local customs and decision-making. In some co-management settings where there is a possibility for tension between factions, college/institute staff can be objective neutral members who can be effective in conflict resolution.

6. **Non-Government Organizations:**
   Environmental NGOs have become effective lobby groups at all levels of policy making. They are a valuable sounding board for political decision-makers and have become effective at promoting their environmental agenda's at the international level. Again, because of their communications skills, academic background and local perspective, college/institute staff can be effective advocates for the environment through their affiliation with their chosen non-governmental organizations.

7. **Municipal Government Involvement:**
   A popular slogan of environmentalists is to "think globally, act locally." Local decisions are the one most likely to directly impact on one's

daily life, yet many people think of local government as junior and therefore less important than regional and national level politics. As was discovered by Mr. Van Camp, opportunities do arise to advocate an environmental perspective via the local government.

8. **Media Relations:**

The media are an increasingly effective educational tool. Good media relations can greatly enhance one's ability to be an effective environmental advocate. Often reporters will be looking for someone with local knowledge and credibility to comment on controversial environmental issues. By making themselves available, college/institute staff can act as resource persons to the media and advocate environmentalism effectively at little cost.

ENVIRONMENT AND RESOURCE MANAGEMENT PROGRAMS

PROGRAMMES ENVIRONNEMENTAUX ET DE GESTION DES RESSOURCES

BRITISH COLUMBIA AND YUKON

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY (BCIT)

Process Technologies - Chemical Sciences

A two-year diploma with second-year specialization in Environmental and Industrial Chemistry, Metallurgy or Pulp and Paper. Course work may include Environmental Science, Applied Chemical Principles, Pollution Science and Organic Chemistry, Pulp and Paper, Pollution Science and Microbiology, Waste Management, and Environmental Analytical Methods. Students are trained to be employed as chemists and analysts in research facilities and commercial and industrial labs; engineering assistants in consulting firms; production supervisor trainees in production plants; analysts in environmental and chemical laboratories; assayers or mineral processing technicians in extractive metallurgy plants; process technologist in pulp mills and as material-testing specialists.

Civil and Structural Technology

Civil and Structural technologists are involved in the design and construction of highways, bridges, airports, railways, municipal works, power developments, dams, canals, docks and harbours. The field has enormous creative potential and offers the technologist involvement in all phases of a project, from design stage to finished job. The diverse and stimulating program includes field trips to assist students in developing their creativity, ingenuity and critical abilities, as well as major projects in which the student develops, in consultation with professionals, appropriate methods of approach and solution. In the second year students may choose their options to provide a degree of specialization in varying areas of the civil and structural technology and include Geotechnical\Highway, Water Resources, Construction and Structures. The program has been accredited at the technologist level by Applied Science Technologists and Technicians of B.C. and, upon completion of the BCIT diploma program, graduates are eligible for membership in the Society.

Renewable Resources Technology
A two-year technologist diploma with two specialization options in Forestry and in Fish, Wildlife and Recreation Technology. The Forestry specialization covers topics such as Forest Management, Botany, Ecology and Soils, Photo Interpretation and Mapping, Silviculture and Reforestation, Protection and Fire Management, Measurements, Engineering, Logging, Production and Utilization, and Forest Pestology. The Fish, Wildlife, and Recreation Specialization covers the Management of Fish, Wildlife and Wild Land Recreation and includes Habitat Ecology, Environmental Inventory Techniques, and Environmental Law with respect to these resources. Course work includes courses in Soils and Natural Resource Administration.

Environmental Health (Public Health) Officer
Students are trained to take the role of preventing disease, promoting health and improving the environment through the use of education, consultation, inspection, and monitoring techniques. Their scope of interest covers areas of food hygiene, insect and rodent control, communicable disease investigation, public accommodation, community care facilities, public recreational facilities, water supply and waste disposal systems, occupational health and safety and environmental pollution, air, soil, and noise. Course work includes Public Health and Pollution Control, Microbiology, Chemistry for Environmental Health, Pest Control, Environmental Health and Engineering, Anatomy, Physiology, Epidemiology and Biostatistics, Drinking Water and Waste Disposal, Environmental Physics, Communicable Disease Control, Food Hygiene, and Environmental Analytical Methods.

Mining
In this two-year program, courses reflect the wide range of applications and include the following: Geology and Mining topics in all terms, Mineral Processing and Assaying, Civil Engineering, Surveying, Physics, Math and Communications courses particularly adapted to mining problems. Projects and assignments emphasize industry applications and a hands-on approach, and are increasingly computer-oriented. Field schools and guest lectures are important aspects of the curriculum.

Petroleum
The curriculum is designed to cover all major aspects of the oil and gas industry, thereby enabling the graduate to successfully enter any area of the industry. The first year covers Petroleum Geology, Reservoir Behaviour, Oil and Gas Production and Field Handling, and Gas

Processing. Emphasis is also given to the basic Sciences Chemistry, Physics and Mathematics necessary for the scientific and engineering principles involved in studies throughout the program. The second year covers Pipeline Transmission, Oil Refining and Product Utilization, and Gas Distribution. Computer use is emphasized in process control and all other aspects of the curriculum. Classroom and laboratory instruction are supplemented by field trips to local installations.

Biological Sciences Technology: Food Technology
This Food Technology program is developed so graduates are able to work in a wide range of food manufacturing and processing industries including fisheries, dairy processing, beverage manufacturing, meat processing, fruit and vegetable processing, cereal and flour production. Quality control of the microbiological, chemical, physical and structural aspects of food products are a normal part of a graduate's work.

CAMOSUN COLLEGE

Civil Engineering Technology
This two-and-a-half year diploma program stresses the use of microcomputers in the solution of civil engineering problems. Students are introduced to computed-aided design and drafting techniques using the Camosun College AutoCAD System and other computer-based design systems for subdivisions, highways and water and water\waste management. Surveying on state-of-the-art "Total Station" technology is also included.

Environmental Technology Diploma
This program includes courses in Biology, Chemistry, Environmental Studies, Geography, Calculus, and Geology. This two-year program provides an excellent grounding in environmental testing and theory.

Horticulture Program
This 10-month program trains students in Soil and Media, Plant Management, Pruning, Irrigation Systems, Pesticide Management, Plant Reproduction and Taxonomy, and Arboriculture.

CAPILANO COLLEGE

Environmental Science Post Baccalaureate Degree Diploma
This diploma is intended for students who have already completed a degree in Science and wish to acquire the knowledge and practical skills

necessary for dealing with environmental issues and project in the workplace. This is a full-year program designed to prepare students to accept leadership roles in environmental problem-solving through a combination of academic and hands-on field assignments. Areas of emphasis include Applied Ecology, Toxicology, Project Management, Environmental Assessment, Law, and Ethics. Completion of an in-depth assignment involving work placement or directed studies is also required.

Fish Culture Technician Program

This eight-and-a-half month program trains students in the art and science of salmonid culture. Basic Salmonid Biology and Husbandry Techniques are taught with the theory backed up by hands-on experience. Work practicums (eight weeks) in this program will involve students living and working at fish culture facilities in order to gain important practical skills. The program utilizes field trips and field days at local fish culture facilities to emphasize important skills. Course content is designed to meet the needs of the commercial fish culture industry as well as the enhancement sector.

Geology

This one-year program is designed for students planning a university degree in the Geological Sciences, including Geophysics, Geochemistry, Environmental Studies and other Earth Sciences, or in the Arts, Humanities, Social Sciences or Engineering. Physical Geology provide an understanding of the origin, structure, composition and history of the earth, with a look at the earth's resources and human intervention, and the Historical geology uses to deduce the origin, age and evolution of earth and its life, the investigation begins with a general view of our "HOME" continent and adjacent ocean basins, and culminates in a detailed examination of our immediate environment; use and abuses of earth resources and environments since the arrival of human beings will form part of this course.

Geography

The study of Geography opens the doors for men and women in a wide variety of fields including teaching, urban planning, forestry, resource management, recreation, economic consulting, mining, fisheries, meteorology and map-making. The focus of Geography is on the environment in which we live. These courses will give you a whole new perspective on the world. The program includes Environmental Geography, Perception and Change; Environmental Geography, Global concerns; Introduction to Earth Environments; Technology and Economic Environments; Urban Studies; Our Atmospheric Environment.

Landscape Horticulture
This full-time eight-month certificate program integrates horticultural theory with practice; the first term emphasizes theory and the second term practical application. The program includes Growing Media and Fertilizers, and Landscape Irrigation and Drainage. For Landscape Installation and Maintenance, the practice maintenance topics include pruning, planting and transplanting, pest management, mulches, and methods of fertilization. Students write the B.C. Ministry of Environment General Dispenser and Landscape Applicator pesticide certification examinations.

Outdoor Recreation Management
The College offers two programs: a two-year diploma in Outdoor Recreation Management and a part-time certificate program in Wilderness Leadership. A new program, tentatively entitled Adventure Travel and Outfitting, is presently under development. The Outdoor Recreation Management program has earned an excellent reputation for its top-quality management and technical skills, wilderness leadership training and employment contacts. Over the past two decades, the College has expanded its network of practicum placements, keeping students in touch with the latest developments and providing access to career prospects. For the part-time certificate Wilderness Leadership program, the students will learn the skills necessary to become accomplished leaders in the outdoors. Canoeing, nordic skiing and mountain travel are the major activities, and safety, emergency management, first aid, and wilderness contingency planning, ethical behaviour in natural environments and the responsibility to pass these attitudes on to others are stressed. Students learn through practical experience and are trained to certifiable skill levels. Level One is designed to provide the student with a basic level of activity skills; Level Two combines basic skills with leadership training.

UNIVERSITY COLLEGE OF THE CARIBOO

Bachelor of Natural Resource Science Degree Program
A program in Natural Resource Science is being developed at UCC to be implemented in September 1992, dependent upon funding availability. This program, the first of its type in Canada, will meet the needs of society, private enterprise and government to develop individuals who will be broadly educated in the basics of natural resource ecology and management, communications and resolution of the wide range of divergent

demands on our renewable resources.

Environmental Studies Certificate
An eight-course certificate program including courses in Biology, Dendrology, Human-Environment Interaction, Geography, Chemistry, Earth's Land and Waters, Climatology, Biogeography, and Environmental Geology.

Forestry Transfer Program
A two-year program to allow for transfer to third year of UBC's Forestry program. It includes courses in Mathematics, Computer Science, English, Science, Economics, and Forestry (Dendrology, Soil, Ecology and Silvics, etc.)

Geography
Geography forms part of the Social and Environmental Studies Department. The academic courses descriptions include Forest and Environmental Climatology, Human Interaction with the Natural Environment, Economic Geography, Geography in an Urban World, Introduction to Historical and Modern Cultural Geography, etc.

DOUGLAS COLLEGE

Geography
This program offers an almost unique opportunity for the synthesis and integration of the fund of human knowledge. Courses offered include Introduction to Human Geography, Human Impact on the Environment, Economic Geography, Social Geography, Introduction to Hydrology, etc.

Geology
It is the study of the composition, origin and development of planet Earth and includes Introduction to Environmental Science designed for students with little or no background in science. This course considers the characteristics of the natural environment and in particular the potential for environmental destruction such as the disposal of toxic wastes. Natural hazards, resources exploitation and land use planning are discussed with special emphasis.

EAST KOOTENAY COMMUNITY COLLEGE

Agricultural Technology
Diploma program includes Study of Agricultural Economics, Soil Conservation, and Animal Nutrition.

FRASER VALLEY COLLEGE

Agriculture Technology
Two-year diploma program offering three areas of specialization: Horticulture; Livestock Production; and Agricultural Management. Courses include Biology, Soil Fertility and Fertilizers, Crop Science, Horticulture, Applied Biology, Forage Crop Production, Soil Management and Conservation, Crops Production, Agricultural Business.

KWANTLEN COLLEGE

Environmental Studies (Geography and Geology)
Program covering the geography and geology of the environment.

Environmental Waste Management
This program trains technologists to work in waste management, and identification and control of negative impacts of pollution on the environment. Program includes Study of Solid Waste/Hydrous Waste Management, Resource Recovery, and Legislation.

MALASPINA COLLEGE

Fisheries and Aquaculture Technology
This two-year diploma program develops well-rounded technologists with a broad background in the practical and academic aspects of fish and invertebrate culture and wild stock management. In addition, skill development includes the areas of management and environmental control. Course work includes Fish Husbandry, Biology, Aquatic Habitats, and Resource Ecology.

Fish Health Technician
An eight-month certificate program encompassing courses in Fish Anatomy, Fish-Environment Interaction, Fish Pathology and Disease Diagnostics, and Disease Prevention and Control.

COLLEGE OF NEW CALEDONIA

Forest Resources Technology
A two-year diploma to train students in Forest Management. Includes courses in Silvics and Dendrology, Soils and Hydrology, Fire Control, English, Computers, Botany and Ecology, Forest Entomology, Logging, and Industrial Relations.

NORTHERN LIGHTS COLLEGE

Agriculture Certificate Programs
A variety of agriculture certificates offer courses including Farm Emergency Procedures, Soil Management, Pest Management, Crop Practices, Animal Health, Livestock Rations and Agricultural Experimentation.

NORTH ISLAND COLLEGE

Forestry Program
An 11-week Silviculture program offered subject to the availability of CEIC funding.

Aquaculture Programs
This provincially-recognized program is offered as a series of open and facility-dependent courses like Overview of Fisheries & Aquaculture, Fundamentals of Wild Stock Management, Freshwater Quality Lab Skills, Fundamentals of Salmonid Disease, Sea Farm Lab Skills, etc.

NORTHWEST COMMUNITY COLLEGE

Pesticide Applicator
A three-day course presents theory and practice required for qualification as a pesticide dispenser or applicator. Subjects include Laws and Regulations, Pesticide Registration, Labelling and Safety, Pesticide and the Environment, and Applicator Technology.

OKANAGAN COLLEGE

Forestry University Transfer Program
Two-semester program covers part of the first year of the Forestry program at UBC. Courses cover Computer Science, English, Ecology and Genetics, Chemistry, Physics, Mathematics, Biology and Physiology. Dendrology must be taken at UBC.

Water Quality Technology
Provides training in the design, use and maintenance of water quality technology. Includes training in the analysis, distribution and treatment of water and wastewater as required by government, industry and environmental monitoring agencies.

Civil Engineering Technology
The program is organized to deal with aspect of civil engineering and urbanization in Canada. It develops appropriate methods of approach and solution for the design and construction of physical facilities such as buildings, bridges, highways, streets, parks, subdivision, dams drainage and irrigation systems, water supply, and sewer systems and plants.

Freshwater Salmonid Aquaculture Certificate Program
The 140-hour program includes lectures, laboratories and field trips dealing with all aspects of fish farming from selecting a site and designing a facility to processing and marketing the product.

SELKIRK COLLEGE

Forestry Extension Training Program
A two-year diploma program. Courses include Reforestation, Forest Vegetation Management, Regenerating High Elevation Sites, Biogeoclimatic Ecology, Renewable Resource Management, Silvicultural Treatment Priorities, Mechanical Site Preparation, Root Rot Management, Regenerating Dry Grassy Sites, Forest Pest Management, Seedling Handling and Production, and Silviculture Survey Certification.

Wildland Recreation
Two-year diploma to train technologists to plan, protect and manage wildland recreation resources. Course work includes Renewable Resources Management, Forest Botany and Ecology, Fire Control, and Fish and Wildlife Biology.

VANCOUVER COMMUNITY COLLEGE

University Transfer Credit - Environmental Geography
A course emphasizing key concepts and theories of environmental studies: physical and biological processes, the ecology of populations and ecosystems, biogeography, resource management, and environmental ethics. The course examines case studies of current environmental problems on a global and a local scale including natural hazards, waste management,

air, land, and water pollution, resource depletion, and species extinction.

Environmental Studies Diploma
Two-year program including courses in Applied Ecology, Environmental Law, and Contemporary Environmental Issues.

YUKON COLLEGE

Renewable Resource Management
A two-year diploma program with the aim of producing generalists who will be able to contribute in a variety of renewable resource fields including fisheries, wildlife, forestry, parks, water, waste and environmental assessment. Course work, supplemented by co-op work experience, includes Mathematics for Renewable Resources, Introduction to Land and Water Resources, Environmental Science, Fish and Wildlife Resources, Environmental Chemistry, Ecology, Forest Protection, Plant Resources, Wildlife Management, Resources Planning, Environmental Impact Assessment, Waste Management, Water Resources Management, and Fisheries Management.

Diploma of Northern Studies - Outdoor & Environmental Studies
Two-year diploma program which enables interdisciplinary study in the relatively pristine Yukon environment. It provides venues for the study of activities which take place in the outdoors and a forum for investigating a range of topics concerned with human-environment relationships.

ALBERTA AND NORTHWEST TERRITORIES

ARCTIC COLLEGE

Environmental Technology
Three-year cooperative program to prepare students for positions with government, industry and other agencies. Course work includes Instruction in Environmental Studies, Ecology, Botany, Wildlife and Fisheries Biology, Resource Economic Geography, Water Resources, Cartography, Spill Response and Hazardous Chemicals, Wildlife Management and Techniques, Land Use Planning, Environmental Assessment, Environmental Law, and Marine and Freshwater Fisheries Management.

Renewable Resources Technology
Two-year program trains technicians in the area of renewable resource management by providing courses in Forest and Range Biology, Forestry, Fire Science, Ecology, Surveying, Water Resources Management, Marine Fisheries Biology and Management, Oil Spill Prevention and Response, Wildlife Techniques and Law Enforcement. The program includes a four-week introductory field camp dealing with an introduction to renewable resources, land use and outdoor skills, as well as a three-week Arctic marine camp dealing with marine biology, ecology, botany and seamanship.

FAIRVIEW COLLEGE

Agricultural Technology
Two-year diploma program offering majors in Agribusiness, Crop Production or Livestock Production. Course work across the three majors includes Study of Soils, Crop Production, Livestock Production, Livestock Nutrition and Diseases, Botany, Crop Diseases and Pests, Agricultural Chemicals, Crop Physiology, Pasture Management, Conservation and Land Management, Feedlot Management, and Agricultural Law.

Crop Pesticide and Fertilizers
An 11-week certificate program which includes Study of Weeds, Crops, Diseases, Insects, Pesticides and their Environmentally-safe Application, and Soils and Fertilizers.

Forestry Operations Certificate
The objective of this 20-week certificate program is to train and qualify people for employment in the forestry industry in such fields as harvesting, protection and reforestation. Course work includes Forest Management, Forest Protection, Silviculture, Wildlife Management, and Environmental Issues and Concerns.

GRANDE PRAIRIE REGIONAL COLLEGE

Agriculture Curriculum
Program designed to prepare students to enter the second or third year of a B.Sc. program at a North American university. Students can specialize in Agronomy, Animal Poultry Science, Plant Protection, Plant Science or Food Services.

Forestry Curriculum
Program designed to prepare students to enter the second or third year of a B.Sc. program at a North American university. The program allows people to work in silviculture, reforestation, forest improvement, forest industry management, fire control or forest research.

LAKELAND COLLEGE

Crops Major - Agricultural Production
Two-year diploma in Agriculture teaches students about field crops, agricultural economics, soil science, fertilizers, weed control, insect and disease control, forage crops and crop chemistry.

Agricultural Homestudy Courses - Pesticide Applicators
This course provide prospective applicators with the background and knowledge necessary to write the licensing exam given by Alberta Environment.

Conservation and Reclamation Major
Two-year diploma in Environmental Science emphasizes soil and water reclamation techniques, pollution monitoring equipment and laboratory instrumentation through course work in Ecology, Pollution Biology, Limnology, Biometrics, Land Use Planning, Forestry, Environmental Chemistry, Watershed Management, and Reclamation Techniques and Soil Science.

Environmental Monitoring and Enforcement Major
Studies emphasize environmental legislation, research, evidence collection and preventive measures. Course work includes Ecology, Limnology, Botany, Environmental Chemistry, Inspections and Investigations for the Enforcement of Pollution Control Legislation, Pollution Abatement and Control, Introductory Soil Science, Environmental Microbiology and Public Health, Appraisals and Environmental Impact Assessments, and Physico-Chemical and Biological Nature of Pollutants.

Fish and Wildlife Major
This two-year diploma in Environmental Science trains students to work as field assistants to fisheries or wildlife biologists by providing students with courses in Chemistry, Zoology, Ecology, Botany, Statistics, Wildlife Nutrition, Wildlife Habitat Management, Forestry, Soil Science, Pollution Biology, and Law Enforcement.

Parks and Recreation Major
Two-year diploma in Environmental Science trains students for positions as outdoor recreational area managers and park officials by providing a range of courses including Park Interpretation, Ecology, Natural History, Botany, Forestry, Soils Classification, and Wildlife Management.

LETHBRIDGE COMMUNITY COLLEGE

Agricultural Technology
Two-year diploma program provides students with five options of study: General Agriculture, Animal Science, Plant and Soil Science, Irrigation Production, and Farm and Financial Management. Courses across these options include Soil, Plant and Animal Sciences, Farm Safety, Crops and Pests, Nutrition, Breeding, Water Conveyance and Measurement, Soil Fertility, Agricultural Drainage, Ecology, Habitat Management, Environmental Data Analysis, Water Resources, Irrigated Soils and Salinity, Aquatic Biology, Water Quality, and Plant Taxonomy.

Irrigation Technology
Two-year diploma program trains students for employment in the irrigation and drainage industry by providing course work in Soil, Plant Science, Land Surveying, Farm Safety, Water Conveyance and Measurement, Irrigated Soils and Salinity, and Agricultural Drainage among others.

Environmental Science Diploma in Watershed Management
The Watershed Management two-year diploma program is aimed at students interested in a technically-oriented career with an emphasis on soil and water resources. Course work includes Environmental Data Analysis, Ecology, Physical Geology, Land Surveying, Plant Taxonomy, Aquatic Biology, Soil and Water Resources, Resource Evaluation and Planning, Soil Chemistry, and Hydrological Survey Techniques.

Renewable Resource Management
The two-year diploma in Renewable Resource Management gives students an understanding of the interrelatedness of all resources and their implications by teaching them about wilderness first aid, vertebrate zoology, physical geology, environmental data analysis, plant taxonomy, aquatic biology, ecology, soil, water, range resources, forest management, wildlife management, fishery science and fire management.

Certificate in Conservation Enforcement
A one-year certificate to be taken after the Diploma in Renewable Resource Management or a related Bachelors degree. Course work includes Criminalistics, Defense and Fitness, Psychology, Parks Operations, Criminal Investigation, Patrol Procedures, Fish, Wildlife and Parks Acts, and Problem Wildlife Management Techniques.

Certificate in Fish and Wildlife Technology
A one-year certificate program to be taken after the Diploma in Renewable Resource Management or a related Bachelors degree. Course work includes Resource Evaluation and Planning, Hydrological Survey Techniques, Big Game, Furbearer, Fishery Management, Habitat Management, Water Quality, Waterfowl and Upland Bird Management, and Fish Culture.

MEDICINE HAT COLLEGE

Agriculture, Food Science and Forestry
Three university transfer programs to provide students with the basis to enter second-year university in these fields. Basic course work in all programs includes English, Mathematics, Biology and Chemistry with a choice of other required and elective courses.

MOUNT ROYAL COLLEGE

Environmental Technology Diploma
Two-year diploma program trains environmental technologists with one of three focuses: Air Pollution Studies, Water Pollution Studies or Waste Management Studies. Course work in these three concentrations includes Biology, Chemistry, Environmental Quality Control (Air or Water), Geography, Natural Science, and Electronics.

Certificate Program
A one-year certificate for individuals with experience in environmental management or related fields. Students can focus on either Air Sampling and Analysis or Water Sampling and Analysis. Course work includes Environmental Quality Control (Air or Water), Geography (Climate, Weather and Meteorology in Air Program), Biology (Ecology and Limnology) and Microbiology (Water Program).

Biological Sciences Technology - Environmental Sciences Option
A two-year diploma program with specialization in the second year.

NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY

Students are provided with instruction in laboratory and field aspects of environmental quality monitoring. Emphasis is placed on laboratory analysis of pollutants, calibration and operation of sampling and analytical instruments, field sampling techniques, and data handling techniques. Students acquire skills in wet chemistry techniques, instrumentation, biological and environmental impact assessment, and air, water and soil sampling. Course work includes Introduction to Waste Management, Air Quality Monitoring and Analysis, Environmental Toxicology, Hazardous Waste Assessment & Remediation, Water & Wastewater Treatment Technology, Environmental Law, and Soils and Vegetation.

Renewable Resources Option

The main emphasis within this option is on basic resources within natural systems. The program includes fisheries and wildlife management, recreation management, land use practice, fish and game management techniques, curatorial tasks, census-taking, surveying and mapping of plant, fish, and mammal populations, habitat assessment and development, parks management and interpretation, and sundry practical field skills. Courses include Taxonomic Botany, Ecological field Methods, Limnology, Wildlife and Range Management, Animal Parasitology, Soils, Fisheries Management, Environmental Law, Entomology, and Ornithology.

Forest Technology

A two-year diploma program including course work in Forest Science, Silviculture, Timber Management, Forest Engineering and Measurements, Forest Soils, Forest Protection, Wildlife and Fisheries, Industrial Resource Management, Land Use, and Remote Sensing.

Geosciences Technology

A two-year diploma program which trains students for positions in the petroleum, coal and metals industries by providing three options of focus: Petroleum Exploration, Mineral Engineering and Ground Water Technology. Course work ranges from Physics, Geochemistry, Geology, Surveying, Stratigraphy and Sedimentation, Tectonics and Data Analysis in the Petroleum Exploration Stream to Physics, Geology, Surveying, Mineralogy, Petrology, Water Quality Studies, Hydraulics, Hydrogeology, Sedimentary Geology, and Data Analysis in the Ground Water Stream.

Ground Water Technology

A two-year interdisciplinary diploma program during which the student will be exposed to a wide variety of subjects that relate to the study of

Ground Water Geology: Hydrogeology, Hydraulics, Hydrology, Soil Mechanics, Chemistry and Physics. Students acquire skills in conducting aquifer tests, analyzing data, ground water monitoring operations, well-drilling selection, installation and development, recommend point-of-use technologies to meet potable drinking water standards. Students find employment in international development projects, the engineering consulting industry, petroleum, oil sands and mineral industries.

Water and Wastewater Technician Program
A one-year certificate program aimed at training students for employment in the fields of water distribution, water treatment, wastewater collection, and wastewater treatment.

CONTINUING EDUCATION COURSES

Pulp and Paper Technician Program
A certificate program offered through distance education. Courses include Effluent Treatment Systems, Pulp and Paper Production and Industry, Sources of Solid Waste and Alternatives for Disposal, Chemical Recovery, and Air Emissions.

Asbestos Removal and Abatement
This course is aimed at workers who are involved in asbestos removal or abatement and includes instruction in health effects, abatement options, regulations, work site planning and preparation, job procedures, tools, equipment, and worker protection.

OLDS COLLEGE

Agricultural Engineering Technology - Environmental Engineering Major
This major prepares individuals to apply engineering principles to environmental concerns. This program covers a wide range of topics including energy conservation, water management, waste management, and other selected environmentally-important topics. Course work includes Water and Sewage Systems, Waste Management, Agroclimatology, Applied Ecology, and Land Resources.

Crop Production Major
This major fosters the development of knowledge and skills that can improve the students' potential in field crop production. Plant and soil

courses are emphasized. Course work includes Farm Management, Agronomy, Soil Investigations, Business, Fertilizer & Soil Amendments, Soil Management, Agricultural Chemicals, Farm Finance, Crop Insects, Crop Diseases, and Weeds.

Horticulture Program
A two-year diploma program emphasizing practical prairie horticulture experience using an integrated approach to environmental issues and economic considerations. All students take common core courses in Soils, Crop Production, Entomology, Pathology, Weeds, Mechanics, Chemicals, and Business Practices. Majors in Landscape Management, Integrated Pest Management, Production, Greenhouse Management, Turf Management, and Interior Plantscape Certificate. Course work includes Entomology, Applied Plant Ecology, Parks and Land Management, Tree and Turf Disease, Plant Taxonomy, Speciality Soils, Insect Pollination, Water Quality, Agroclimatology, Field Crop Diseases, Agribusiness Management, Soil Conservation, Arboriculture, and Water Quality.

Land Resource Management
A two-year diploma program offering training in the management of field crops, soils, water and pests through a choice of five majors including Agronomy, Integrated Pest Management, Soil and Water Conservation, Land Classification and Reclamation, and Agricultural Fieldsman. Course work in this program includes Physical Geology, Agroclimatology, Ecology, Taxonomy, Physiology, Soil, Agricultural Chemicals, Weeds and Weed Control, Water Quality, Range Management, Irrigation, Hydrogeology, Experimental Methods, Drainage, Land Use Planning, and Crop Diseases.

Land Classification and Reclamation Major
This major in the Land Resource Management program trains students in the use of land classification and mapping systems, soil survey methodology, and the utilization and interpretation of resource inventory information.

RED DEER COLLEGE

Bachelor of Science in Agriculture
A one-year university transfer program leading to a four-year degree in Agriculture, this program provides specializations in Agricultural Economics, Agricultural Sociology, Agricultural Engineering, Agronomy, Animal or Poultry Science, Entomology, Grazing Management, Plant

Science, and Soil Science.

Bachelor of Science in Forestry
A one-year university transfer program leading to a four-year degree in Forestry, this program provides specializations in Forest Economics, Forest Hydrology, Forest Management, Grazing Management, and Wood Utilization.

SASKATCHEWAN

NORTHLANDS COLLEGE

Chemical Laboratory Environmental Technician
This program provides job-oriented training in chemical analysis, chemical plant operation, and environmental monitoring with a major emphasis towards the mining industries. Courses include Organic and Analytical Chemistry, Chemical Engineering, and Environmental Pollution Control.

Vocational Forestry
A thirty-week program enabling students to demonstrate personal skills, use and care for tools and equipment, operate and maintain chainsaws and bush saws, plant trees, perform preventative maintenance and services, and operate cable skidders and short wood forwarders.

PRAIRIE WEST REGIONAL COLLEGE

Agriculture
Non-credit courses are available in subjects including Hydraulics, Reclamation of Saline Soils, Soil Management, Soil and Water Conservation, Pesticide Application, and Farm Management.

SIAST - Kelsey Campus

Agriculture
Courses offered include Soils and Crops, Farm Fruit Growing, Grain Drying and Aeration, Hydroponics, Farm Irrigation, Pulse and Special Crop Production, Soil Management, and Weed Control and Sprayer Operation.

SIAST - Palliser Campus

Water Resources Engineering Technology
A 30-month co-op program providing skills for employment in water resources engineering fields. Course work includes Geology, Recreation, Soil, Terrain Evaluation, Chemistry, Water Chemistry, Hydraulics, Electricity, Hydrometeorology, Surface Hydrology, Ground Water Hydrology, Water and Wastewater Treatment, Land and Water Development, River Engineering, Irrigation, and Communications.

SIAST - Woodland Campus

Integrated Resource Management
An 80-week program that trains students to describe environment, anatomy and physiology, interpret and apply regulations and policies, collect and analyze wildlife data, manage wildlife programs, conduct aquatic surveys, protect fish habitat and populations, handle fish and fish products, perform forest measurements, integrate resource management, and integrate people with wildlife.

Fisheries Technician
This 42-week program trains students to describe environment, interpret and apply regulations and policies, ensure public safety, collect and analyze wildlife data, conduct aquatic surveys, protect fish habitat and populations, assist with fish enhancement projects, handle fish and fish products, and integrate resource management.

Forestry Technician
This 45-week program trains students to describe the environment, interpret and apply regulations and policies, implement fire control protection, perform forest measurements and integrate resource management.

Mining Technician
This variable length program can train students in one of four areas: prospecting, mining geophysics, underground mining or uranium mill operation. Course work includes Rock and Mineral Identification, Geology, Geophysical Surveying, Mine Safety Procedures, Blasting, and Ore Movement among others.

Wildlife Technician
This 43-week program trains students to describe the environment, interpret and apply regulations, ensure public safety, collect and analyze wildlife data, manage wildlife programs, conduct aquatic surveys and

integrate resource management.

SIAST - Wascana Campus

Soils and Crops
This program provides a variety of courses including Crop Production, Pulse and Special Crop Production, Forage Crop Production, Weed Control and Sprayer Operation, Pasture Management, Soil Management, Vegetable Gardening, Farm and Home Landscaping, Farm Greenhouse Operation, Farm Greenhouse Construction, Farm Irrigation, Grain Drying and Aeration, Hydroponics, and Farm Fruit Growing.

Pesticide Applicator
This two-week program provides updated knowledge of chemical pesticides, application methods and current techniques. Course work includes Agriculture Pest Control, Vegetation Control, Non-agricultural or Urban Pest Control, and Structural Pest Control.

Agricultural Outreach
This program provides a one- to four-week certificate. Course work includes Farm Management, Applied Farming, Agricultural Mechanics, Animal Production, Soils and Crops, and Pesticide Application.

Agricultural Production Technician
This 78-week certificate program provides courses in Soil Management, Hydraulics, Pulse and Special Crop Production, Crop Production, Weed Control and Sprayer Operation, Grain Drying and Aeration, Pesticide Application, and Farm Management.

SASKATCHEWAN INDIAN INSTITUTE OF TECHNOLOGIES

Integrated Resource Management
The two-year IRM diploma program addresses resource issues specific to Indian people and communities. The program supports knowledge and skill development; park management and enforcement; wildlife, fisheries, forestry management, and integrated resources.

MANITOBA

ASSINIBOINE COMMUNITY COLLEGE

Agricultural Training Courses
Training is provided on a module basis and can be offered in any Manitoba community based on demand and facilities. Subject areas available are Farm Business Management, Canadian Grain Marketing Systems, Farm Machinery Maintenance, Training for Women, Agricultural Welding, Human Resource Agricultural Training, Beef Production, Forage Production, Applied Agriculture, Computers in Farm Management, Advanced Computer Applications, Computerized Management Systems for Livestock, and Farm Feedlot Management.

Agricultural Program - Home Study
The following programs are offered as home-study credit courses: Soils, Crops, Farm Business Accounting, Agricultural Law.

Applied Agriculture
A one-year certificate and a two-year diploma are offered to give students the skills to operate a farm business. Course work includes Agricultural Law, Special Crops, Animal Science, Forage Production, Agricultural Economics, and Farm Supply.

THE MANITOBA TECHNICAL TRAINING CENTRE

Energy Conservation Opportunities in the Small Industrial Plant
A course designed to show how to identify areas in small industrial plants where changes can result in considerable savings and energy conservation.

ONTARIO

COLLEGE DE TECHNOLOGIE AGRICOLE ET ALIMENTAIRE

Génie rural et environnement
Le programme est d'une durée minimale de deux ans. Les cours permettent à l'étudiant(e) d'acquérir des connaissances de base qui lui sont nécessaires pour travailler dans les domaines de l'exploitation et de l'amélioration des sols, du machinisme agricole et de la protection de l'environnement.

ALGONQUIN COLLEGE

Forestry Technician

This four-semester, two-year diploma trains students to a career as assistant to a forester or other professionals dealing with renewable natural resources. Course work includes Forest Flora, Forest Measurements, Forest and Soil Ecology, Fire Control, Forest Botany, Dendrology, Forest Entomology and Pathology, Law and Forest Statutes, Wildlife Biology, Harvesting, Silviculture, Forest Surveying, Forest and Watershed Management, Ecological Land-use Planning, Wildlife Management, and Forest Tree Improvement.

CAMBRIAN COLLEGE

Horticulture Technician

The two-year program activities are designed for properly-trained and knowledgeable people in landscaping, grounds maintenance, sod and vegetable production. Participants will learn the importance of the cultivated plant's interaction with its environment and how it applies to horticulture. They will manage a greenhouse environment and compare greenhouse structures, will learn how to utilize fertilizers and pesticides for horticulture application, and gain an understanding of basic soil-plant relationship.

Civil Engineering Technician

The Civil Engineering Technician is a two-year program. Technicians are concerned with drafting, surveying, construction methods, costs, quality control and inspections. Their responsibilities could include maintenance of roads, bridges, buildings, dams, sewage and water treatment systems, airports, pipelines, subways and railways.

Civil Engineering Technology

This three-year program is concerned with the design, construction and maintenance of such facilities as roads, buildings, dams, sewage and water treatment systems, airports, pipelines, subways, and railways. The technologist may be involved in the design and supervision of projects, the interpretation of data, cost estimating and scheduling, feasibility studies and surveying.

Environmental Horticulture

This 40-week program is offered in two interrelated phases. The program is designed to educate students in the basic knowledge and the fundamental skills of general horticulture.

CENTENNIAL COLLEGE

Civil Engineering Technology (Public Works)
A three-year program to prepare students to build, design, survey, inspect, test and supervise. Courses include Soil Testing, Field Surveying, Water Supply and Sewage, Design of Water Supply Systems and more.

Civil Engineering Technician (Public Works)
A two-year program where the students learn a variety of design and other skills like soil testing, field surveying, water supply and sewage, and more.

Environmental Protection Technician
This two-year diploma program enables students to learn how to sample for and perform standard environmental tests for the analysis and monitoring of treated and untreated water, wastewater, air, soil, and solid samples for biological and chemical contaminants. Courses include Environmental Protection and Industrial Safety, Biological Systems, Applied Microbiology, Chemistry of Pollutants, Biochemical Analysis, Ecology, Water Quality Control, Pollution Prevention and Control, and Environmental Sampling and Data Management.

CENTRALIA COLLEGE

Agricultural Business Management
This two-year program offers an overall education in farm production, management and financial management. The main emphasis is placed on agricultural business. Course work includes Soil Management, Plant Science, Water Management, Agricultural Economics and Business, Crop Fertility, Crop Research Methods, and Pest Control.

LA CITÉ COLLÉGIALE

Techniques et sciences de l'environnement
Ce programme de deux ans est axé sur la protection de l'environnement et les problèmes de pollution. Il met l'accent sur la cueillette et l'analyse des données scientifiques qui supportent les études d'impact environnemental.

DURHAM COLLEGE

Environmental Technician Certificate
Offered through the Continuing Education Department, this program

includes courses in Chemistry, Environmental Regulations, Waste Management, Environmental Testing Methods, Environmental Science, Microbiology, and Organic Chemistry.

Environmental Technology
This three-year diploma program provideS the technological background needed for graduates to work in areas of environmental concern. The focus is to train students in the Chemical and Biological Sciences as they relate to such areas as monitoring of air and water quality, and waste management. It is intended to blend the technical aspects of Environmental Management with the social, community and planning areas of this discipline. Courses include Environmental Chemistry, Microbiology, Environmental Toxicology, Industrial Waste Management, Urban Environmental Planning, Environmental Engineering, Spectroscopy, and Chromatography.

Civil Engineering Technology
This three-year diploma study program involves road and highway design and upkeep, building design, public works, sewage treatment, environmental engineering, structural design in steel and concrete, and management studies and statistics.

Civil Engineering Technician
This two-year diploma study program concerns the planning, design, construction and maintenance of structural projects such as buildings and bridges, municipal and transportation facilities such as water supply, sewage disposal, pollution control, highways, railways, airports, etc.

FANSHAWE COLLEGE

Civil Engineering Technology
This three-year cooperative program provides training in both the municipal and structural areas. The design of steel frame and reinforced concrete buildings is primary in the structural area. Training is provided in materials testing and computer-aided drafting. Municipal topics include the design and construction of water distribution systems, storm and sanitary sewerage networks, and highway. Theories for the treatment of water, sewage and solid wastes are analyzed.

Design (Landscape)
A three-year cooperative study program providing training in the design of many types of landscape areas, with emphases on small scale commer-

cial, institutional and residential landscapes. A variety of skills in areas such as drafting, rendering and composition are combined with the knowledge of design theory, plant materials and landscaper materials, and environmental psychology.

Design (Urban)
This three-year co-op program emphasizes design and technical skill with practical work. It provides a broader spatial context and approval procedures for architecture, and is often considered the marriage of urban and regional planning with architecture, focusing on the human being's relationship with the physical environment, be it a new or older commercial, residential or industrial site, apartment complex or commercial plaza development.

Environmental Technology - Co-operative
This three-year diploma program provides students with a general knowledge of air, water, waste and noise management. Course work include Cytology, Chemistry, Physics, Aquatic Biology, Organic Chemistry, Microbiology, Anatomy and Physiology, Air Quality Management, Air Sampling and Evaluation, Water Sampling and Evaluation, Water Quality Control, Fluid Mechanics, Noise, Energy and the Environment.

Environmental Engineering Technician - Waste Management
This two-year diploma program offered through the Adult Education Department includes course work in Environmental Biology, Chemistry, Law, Waste Management, Landfill Theory and Practice, Water Facility Management, and Sewage and Industrial Wastes.

GEORGIAN COLLEGE

Civil Engineering Technician - Co-op Program
This two-year program will teach the student to communicate effectively, perform standard survey work, interpret and produce engineering drawing, and assist with environment impact studies.

Environmental Engineering Technology - Co-op Program
A three-year program providing students with strong theoretical knowledge in the areas of Water Treatment Technologies supplemented by good basic training in Civil Technology and practical knowledge through co-op work terms. Courses include Ecology, Soil Properties, Geology, Drainage, Aquatic Biology, Chemistry, Environmental Science, Applied

Hydrology, Toxicology, Environmental Chemistry, Solid Waste Management, Environmental Issues, Industrial and Municipal Waste Treatments, and Pollution Control.

HUMBER COLLEGE

Civil Engineering Technician
A two-year program where students learn to perform laboratory test on soil, concrete and other materials to determine their suitability for various purposes; produce the technical drawings necessary for the construction of bridges, buildings and dams; discover how water purification and treatment plants are designed; and learn how to plan and survey the lay-out of roads and highways.

Civil Engineering Technology - Co-op
This three-year diploma program is the continuation of the Technician program adding one year. Course work includes Geotechnology and Environmental Technology.

Environmental Systems Engineering Technology - Energy Management
This three-year diploma program will provide its graduates with a broad and intensive knowledge of the design, operation and installation of energy systems for residential, commercial and industrial complexes. A graduate will be capable of applying engineering principles and conventions to achieve optimum energy conservation through a process of evaluation, monitoring, control, assessment and corrective action.

Horticulture Apprenticeship
This two-semester 20-week program provides students with course work in Botany, Pesticides, Soils, Plant Propagation, and Plant Materials.

Landscape Technician/Technologist
A two-year program to train technicians which can be extended into the four-year Technologist program. Students major in either Landscape Horticulture or Urban Forestry/Arboriculture in their second year. Course work includes Soils, Botany, Plant Identification, Pest Control, Entomology and Pathology, Plant Propagation, Arboriculture, Tree Identification, Irrigation Systems, Woody Plant Appraisal, Floriculture, Plant Utilization and two co-op placements.

Safety Engineering Technology
This three-year program involves students in the recognition and evaluation of potential loss-producing conditions due to occupational hygiene and safety problems. They will also be involved in the development of practical programs to prevent and control potential losses. Course work includes Occupational Health and Safety, Environmental Protection, Manufacturing Process and more.

Urban Arboriculture
This two-semester program is designed to train urban tree workers. Course work includes Arboriculture, Tree Identification, Arboriculture Science, Pest Control, and Forestry and Landscape Equipment and Maintenance.

KEMPTVILLE COLLEGE OF AGRICULTURE TECHNOLOGY

Field Crops and Livestock Production and Management
This two-year diploma program in Agriculture is very similar to that of the Dairy Cattle program in the first year. The senior year is oriented toward the student who is more interested in the cash crops and market livestock type of enterprise, either from the producer or service business viewpoint. Course work includes Water Management, Crop Management, Turf Management and more.

Horticulture Production and Management
This two-year diploma program provides training related to every aspect of today's horticultural industry. It offers courses in Fruit and Vegetable and Greenhouse Crop Production, but in Landscaping, Lawn and Garden Maintenance and Turf Management as well.

LAMBTON COLLEGE

Environmental Ecology
This three-year co-op program offers course work in Air and Water Quality Control, Municipal and Industrial Waste Treatment, Microbiology, and Chemistry. Graduates will have strong theoretical knowledge and practical hands-on experience in environmental control management.

LOYALIST COLLEGE

Civil Engineering Technician/Technologist

This two-year (Technician) or three-year (Technologist) program includes the construction, operation and basic design principles for physical works and facilities such as highways, railways, canals, pipelines, bridges, dams, water and sewage treatment systems, buildings, any project implemented by Civil Engineering. The third year provides more supervision techniques and more advanced analytical techniques.

Environmental Technician/Technology

This two-year (Technician) or three-year (Technologist) program teaches students about the environment and potential contaminants through course work in Biology, Ecology, Water and Wastewater Processes, Chemistry, Organic Chemistry, Hydrogeology, Hydrology and Hydrometry, Air Quality, Hazardous Waste Techniques, Environmental Assessment, Water Quality, and Resources Management.

MOHAWK COLLEGE

Civil Engineering Technician

This two-year diploma program provides a well-balanced technical training which will enable students to perform the following tasks related to the civil engineering field: collect and compile data and information that will be used to solve engineering problems; carry out engineering and construction surveys; assist in the preparation of technical reports, contract documents and drawings, and in the application of appropriate operation and maintenance procedures; carry out inspection and quality control activities.

Civil Engineering Technology

This three-year diploma program provides both theoretical knowledge and specialized training which will help students perform the following tasks: conduct and/or supervise engineering surveys; prepare and present technical reports; assist in designing, drafting and supervising the construction of water distribution and waste disposal systems, buildings, bridges and roads; manage activities associated with construction projects; apply appropriate operating and maintenance procedures to ensure efficient facility usage; communicate with individuals and groups using oral, written and interpersonal skills in assessing and responding to civil engineering needs.

Environmental Technology
This program forms a third-year option in the Chemical Engineering Technology Program. Course work is the following: Organic Chemistry, Air & Wastewater Treatment 1-2, Environment Regulations, Environment Biology and Toxicology, Lab and Process Automation 1-2, Sampling and Analysis, Environmental Projects, Hazardous and Solid Waste Management.

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

Agriculture
A four-semester program including courses in Crop Science, Soil Management, Farm Structures and Environment, Farm Safety, Crop Pest Control, Agriculture and Society, and Livestock Breeding and Genetics.

NIAGARA COLLEGE

Horticultural Technician Diploma
A two-year program providing course work in Botany, Practical Horticulture, Soils, Indoor Plants, Arboriculture, Plant Protection, Pests, Diseases and Weed Control.

RIDGETOWN COLLEGE

Crop Production Diploma
A two-year program is offered in two areas. The Field Crop Specialization offers the following courses: Field Crop Equipment, Soil Management, Insects and Diseases, Water Management, Feeds and Feeding, Soil Fertility, Weed Control and Identification, and Soil and Water Conservation. The Fruit and Vegetable Crop Specialization offers course work in Small Fruit Production, Tree Fruit Production, Warm Season Vegetable Crop Production, Field Studies and Horticulture Crop Marketing, Greenhouse Crop Production and more.

Horticulture Diploma
This two-year program is offered because the industry needs people who understand plant biology and chemistry, plants propagation, floral design and retailing. It requires people who are licensed to control weeds, insects and diseases and who are conscious of the need to protect the environment. Course work includes Soil Management, Plant Propagation, Greenhouse Crop Production, Insects and Diseases, Water Management, Arboriculture, Turf Management, Weed Control and

Identification, and more.

SAULT COLLEGE

Environmental Engineering Technology/Technician - Cooperative Education

This two-year diploma program provides students with an opportunity to prepare for a career in environmental engineering, specifically municipal engineering applications of water and wastewater treatment facilities. Emphasis is placed on civil, water, and environmental operations and applications and chemical analyses in water and air pollution control. Aquatic Biology, Water Pollution, Soil Mechanics, Wastewater Treatment, Hydraulics, Water Chemistry and Watershed Management, Hazardous Waste Disposal, Water Wells and Pumps, Pollution Economics are part of course work.

Forestry Technician Cooperative Education

A two-year program designed to prepare graduates to assist foresters, biologists and other scientists. Course work includes Biology, Ecology, Environment Biology, Forestry, Descriptive Dendrology, Forest Protection, Forest Mensuration, Forest Utilization, Forest Entomology, Forest Pathology, Silviculture, Management of Renewable Resources, Forestry Law, and Surveying.

Fish and Wildlife Technology Cooperative Education

This one-year program is designed to extend the education given in forestry and other related technical programs through course work in Forest Biology, Environment Biology, Forestry, Forest Protection, Dendrology, Forest Utilization, Forest Pathology, Silviculture, Renewable Resource Management, Natural Resource Planning, Environmental Measurement, Watershed Management, Wildlife Surveys, Wildlife Interpretation, Fisheries Biology, Aquatic Surveys, and Surveying.

Forest Management Technology Cooperative Education

This one-year program addresses the increasing urgency of regenerating Canada's forests through course work in Biology, Ecology, Environment and Forest Biology, Forest Protection, Dendrology, Forest Utilization, Forest Entomology, Forest Pathology, Renewable Resource Management, and Forestry Law.

Parks and Forest Recreation Technology Cooperative Education

This program extends the education given to forestry technicians through

course work in Biology, Ecology, Silviculture, Forest Protection, Dendrology, Forest Pathology, Park Law, Wildlife Interpretation, Natural Resource Planning, Forest Utilization, and Watershed Management.

Meteorological Technology Cooperative Education
This two-year program provides a basic education in geology, geophysics and mining. Course work includes Geochemistry, Geophysics, Mineral and Petrol, Physical Geology, Mineralogy, Field Geology, Stratigraphy, and Surveying.

Pulp and Paper Engineering Technology Cooperative Education
A three-year program including course work in Forest Biology, Water Pollution, Chemistry, Industrial Hygiene, Water Chemistry, Organic Chemistry, Forestry, Hydraulics, Thermodynamics, Pulp and Paper Technology, Process Control, Water Supply Treatment, Wastewater Treatment, Environmental Impact Assessment, and Hazardous Waste Disposal.

Water Resources Engineering Technology Cooperative Education
A three-year program designed to prepare graduates for careers in hydrology, water supply technology, wastewater treatment, waste management and water pollution control. Course work includes Aquatic Biology, Water Pollution, Chemistry, Water Chemistry, Watershed Management, Aquatic Surveys, Geomorphology, Hydrology, Hydraulics, Pulp Technology, Water Supply Treatment, Wastewater Treatment, Water Wells and Pumps, Pollution Economics, Environmental Impact Assessment, and Hazardous Waste Disposal.
Seneca College

SENECA COLLEGE

Resources Engineering Technician
A two-year co-op diploma program including course work in Man, Nature and Society, Environmental Science, Surveying, Ground Cover and Vegetation, Physical Geography, Hydrology, and Planning.

Resources Engineering Technology
A three-year co-op diploma program including course work in Man, Nature and Society, Environmental Science, Surveying, Ground Cover and Vegetation, Physical Geography, Hydrology, Planning, Marine Environment, Soils, and Resources Management.

SIR SANDFORD FLEMING COLLEGE

Aquaculture Technician
A two-year program focusing on the mechanical and maintenance aspects of fish culture, disease prevention, detection, control and eradication, and small business management in aquaculture. Course work includes Ecology and Environmental Studies, Resource Engineering, Earth Sciences, Aqua/Fish & Wildlife Biology and Forestry/Parks Biology.

Environmental Waste Management
A three-year diploma program with specialization in the fourth semester. Students develop an understanding of environmental issues, policies and laws, sustainable development, environmental waste audits, health and safety, and public safety.

Fish and Wildlife Technician
A two-year program providing students with a basic knowledge of the natural environment through course work in Earth Sciences, Ecology and Environmental Studies, Resource Engineering, Biology, Fisheries and Limnology, Wildlife Management, Aquaculture in Fisheries Management, Vertebrate Biology, Forest Soils, Fisheries Management, Forest Fire Science, Forestry Practices, Biometrics, Wildlife, and Animal Pathology.

Fish and Wildlife Technology
This one-year program follows a Fish and Wildlife Technician diploma. It includes course work in Big Game and Fur Management, Limnology, Sport and Commercial Fisheries, Environmental Analysis, Waterfowl Management, Environmental Monitoring, Marine Resource Management, and Water Studies.

Forest Recreation Technician
A two-year program in Forest Recreation which includes course work in Earth Sciences, Ecology and Environmental Studies, Resource Engineering, Biology, Dendrology for Parks, Forest Measurement and Management, Environmental Ecology, Habitat Management for Fish and Wildlife, Entomology, Pathology, Weed Science, Forest Soils, Pestology and Spraying, and Forest Fire Science.

Geological Technician/Technology
A two-year Technician diploma program or a three-year Technologist diploma program is available. Graduates will find employment in the areas of evaluating land for construction, environmental assessment, mineral occurrence, etc. The third-year Technology option allows students to

pursue studies in a chosen option such as Minerals, Geotechnical or Geosciences. The occurrences of minerals, mining land management and geophysics is explored in the Mineral option while the Geoscience curriculum looks at Environmental Exploration Methods, Introductory Geochemistry and Ground Water.

Parks and Forest Recreation Technology

This one-year program follows the Forest Recreation Technician diploma which includes course work in Park Interpretation, Park Administration, Arboriculture, Integrated Resource Management, Park Facility Maintenance, and Park Master Planning.

Forestry Technician

A two-year program including course work in Earth Sciences, Ecology and Environmental Studies, Resource Engineering, Biology, Forest Soils, Dendrology, Forest Fire Science, Forest Mensuration, Integrated Resource Management, Ecology and Silvics, Forest Entomology and Control, Surveying, Forest Pathology and Control, Silviculture, and Forest Management.

Forestry Technology

A one-year program following the Forestry Technician diploma which includes course work in Tree Climbing, Forest Management Planning, Urban Tree Maintenance, Forest Renewal, and Integrated Silviculture Planning.

Natural Resources Technology - Law Enforcement

A one-year program following a Technician or Technologist diploma which includes course work in Lands/Parks Enforcement, Procedural Law, Fish/Wildlife Enforcement, Firearms, Wildlife Identification, Environmental Law, and Investigation Techniques.

Pest Control Technician (Environmental Pest Management)

This two-year program is designed to train students in the principles and practices of Pest Management through course work in Earth Sciences, Ecology and Environmental Studies, Resource Engineering, Biology, Pesticide Application Techniques, Pesticides, Urban Entomology, Vertebrate Pest Management, Urban and Industrial Vegetation Management, Landscape Pest Management, and Pesticide Chemistry.

Pest Management Service Person

This 16-week program can be taken after the completion of Grade 10 and will train students to become a service person in the structural pest

control industry. Course work includes Pest Management Techniques, Pesticide Application and Equipment, Urban Pest Biology, and Mathematics for Pest Management.

Forest Nursery Worker
This 12-week program can be taken after the completion of Grade 10 and trains students for work in a greenhouse or forest nursery. Course work includes Greenhouse Operations, Botany, Propagation Techniques, Plant Identification, Soil and Plant Nutrition, Seed Technology, Nursery Operations, Irrigation and Nursery Equipment, and Pest Control.

Terrain and Water Resources Technician/Technology
The Technology program is a three-year diploma program and the Technician program is a two-year diploma program. The Technician program includes course work in Pollution Monitoring and Abatement, Revegetation/Restoration of Disturbed Land Areas, Water Sampling and Analysis, Land Reclamation and Erosion Control Practices. The Technologist program offers Advanced Techniques for Sampling the Environment, Various Approaches to Waste Management, and Nature and Behaviour of Contaminants.

Urban Tree Maintenance
This 16-week program can be taken after the completion of Grade 10 and trains students in the care and maintenance of trees in an urban environment. Course work include Tree Climbing, Tree Maintenance and Removal, Dendrology, and Pesticide Application.

Resource Services Division
Provides a two-year General Arts and Science diploma which aims to provide basic courses that are program-relevant to the Resource Management and Resource Technology divisions.

ST. CLAIR COLLEGE

Civil Engineering Technology
This three-year program will provide interest in the various facets of the construction field and in solving our environmental problems. Course work includes Design, Construction, Supervision, Inspection, Materials Testing of Buildings and Other Structures Including Waterways, Hydroelectric Plants, Shoreline Protection Systems and Power-Control Systems.

Landscape Techniques
This one-year program is designed to train students with an interest in enhancing the ecological environment to become skilled technicians in various phases of horticulture.

Landscape Technician
This two-year program is very interesting because of the satisfaction gained from the designing, growing, implementation and maintenance of plant life in our local environment.

ST. LAWRENCE COLLEGE (CORNWALL CAMPUS)

Environmental Studies - Part-time Program (MCU Approval Pending)
This post-diploma program deals primarily with environmental legislation and compliance. The student's knowledge base with respect to wide-ranging environmental issues, air pollution, water pollution, solid waste control systems, technical reporting, detection methods and statistical control will be broadened. Course work includes Environmental Science, Legislation, Air Pollution Control Systems, Water Pollution Control Systems and Solid Waste Control Systems.

QUÉBEC

CÉGEP D'ALMA

Gestion et exploitation d'entreprises agricoles
Ce programme fournit aux étudiant(e)s les notions théoriques et pratiques pour assurer efficacement les tâches multiples et complexes de l'agriculture moderne. Il comprend des stages pratiques supervisés qui se déroulent sur une ferme de production et les étudiant(es) peuvent se spécialiser en production animale ou en production végétale. Les cours suivants en font partie : Systèmes comptables agricoles, Réalités agricoles du Québec, Sol et fertilisation, Régie de production légumière, Régie de production laitière, Régie de productions animales, Régie de l'eau et conservation du sol, et Droit rural et fiscalité.

CÉGEP DE BAIE-COMEAU

Technologie forestière/Aménagement forestier
La technicienne ou le technicien dans ce secteur d'activités voit à l'application technique des différentes connaissances relatives à l'aménagement de la forêt. Les principales fonctions de travail sont reliées à la gestion, à

la planification, à la conservation et à l'utilisation rationnelle des forêts.

Gestion intégrée du territoire
Le programme permet à l'étudiant(e) adulte autochtone d'acquérir les aptitudes nécessaires pour gagner sa vie par la mise en valeur et la gestion rationnelle des ressources renouvelables du territoire; d'acquérir des connaissances scientifiques, techniques et administratives nécessaires à la gestion des ressources du milieu naturel; et d'harmoniser ses relations avec la nature de façon à conserver un équilibre entre les actions d'exploitation des ressources et le potentiel de production du milieu naturel. Le programme regroupe trois attestations d'études collégiales partageant le même bloc fondamental. Puis, chaque attestation comprend un ensemble de cours portant sur les ressources forestières et fauniques ou la conservation et la protection avant d'offrir une spécialisation particulière dans deux attestations.

INSTITUT DE TECHNOLOGIE AGRO-ALIMENTAIRE DE SAINT-HYACINTHE

Technologie alimentaire : production
Ce programme forme des technologistes préparés spécialement pour la transformation et la fabrication de produits alimentaires. La grille des cours comprend les sessions
suivantes : Chimie organique, Microbiologie générale, Technologie des produits végétaux, Technologie des produits animaux, Biochimie, Économie de l'agro-alimentaire, Thermodynamique et Technologie des produits laitiers.

Technologie alimentaire : contrôle de la qualité et développement
Ce programme forme des technologistes préparés spécialement pour le contrôle de la qualité des produits alimentaires et le développement de nouveaux produits alimentaires. La grille de cours comprend : Chimie générale et des solutions, Chimie organique, Microbiologie générale, Salubrité et traitement des eaux, Microbiologie industrielle et biotechnologie, Technologie des produits végétaux, Technologie des produits animaux, Économie de l'agro-alimentaire, Biochimie, Chimie analytique, Nutrition humaine et Technologie des produits laitiers.

Horticulture légumière et fruitière
Ce programme permet aux étudiant(e)s d'acquérir une formation fondamentale en phytotechnie et une spécialisation dans certains domaines. Botanique, Biologie horticole, Chimie générale et organique, Physiologie végétale I-II, Microbiologie horticole, Principes de fertilisation, Micro

propagation appliquée, Taxonomie générale, Génétique générale, Sols, Écologie, Introduction à la biochimie et Économie agricole sont quelques-uns des cours qui font partie du programme.

JOHN ABBOTT COLLEGE

Environmental Geography
This course aims to give students an understanding of the relationships between human beings and their geological environment. The course focuses on mineral resources and their use in society.

Forest Technology
A single course in Quebec forest resources for students in other disciplines.

CÉGEP JOLIETTE - DE LANAUDIERE

Gestion et exploitation d'entreprise agricole
Ce programme de six sessions vise à développer chez l'étudiant(e) la capacité de gérer et d'exploiter rationnellement une ferme dans une agriculture constamment en évolution. Les réalités agricoles du Québec, la zootechnie, les sols et la fertilisation, l'aménagement et le travail du sol, la planification de l'entreprise agricole, le droit rural et la fiscalité, et la gestion financière sont quelques-uns des sujets qui sont abordés.

CÉGEP DE JONQUIERE

Techniques d'assainissement et sécurité industriels
Ce programme a pour but de former des techniciens et des techniciennes spécialisés dans le domaine de la prévention des accidents de travail, des maladies industrielles et des problèmes engendrés par les rejets industriels. Il comprend un stage de travail et les cours suivants : Chimie générale, Éléments d'anatomie et de physiologie humaines, Environnement sonore, Analyse des eaux, Contaminants chimiques I-II, Contaminants physiques, Contaminants biologiques, Contrôle des contaminants, Eaux industrielles I et Air industriel I.

CÉGEP DE LA GASPÉSIE ET DES ILES

Techniques forestières
La botanie, la dendrologie, la botanie forestière, la géomorphologie forestière et la topographie sont quelques-uns des sujets traités au cours

de ce programme de quatre sessions.

Exploitation forestière
Ce programme de deux sessions vient s'ajouter au programme de Techniques forestières et vise la formation de spécialistes qui se destinent vers la surveillance et la restauration forestière. Parmi les cours offerts, signalons Photo-interprétation, Protection contre les feux de forêt et Gestion forestière.

CÉGEP DE LÉVIS-LAUZON

Gestion et exploitation d'entreprise agricole
Les réalités agricoles du Québec, la zootechnie, la santé animale, les sols et la fertilisation, la régie de la production laitière, la régie des productions animales et le droit rural et la fiscalité font partie des sujets traités au cours de ce programme.

CÉGEP DE MATANE

Gestion et exploitation d'entreprise agricole
Le programme couvre une variété de sujets y compris le choix de trois spécialisations : Introduction aux affaires agricoles, Gestion des affaires dans l'entreprise agricole et Pratique des affaires en agriculture. Parmi les cours offerts, notons les suivants : Aménagement et travail du sol, Réalités agricoles du Québec, Sols et fertilisation, Alimentation et santé animale, Régie des productions céréalières et herbagères, Régie de production laitière, et Droit rural et fiscalité.

CÉGEP DE RIMOUSKI

Technologie forestière
Il existe quatre choix de programmes : Aménagement forestier (trois ans), Exploitation forestière, Transformation des produits forestiers et Technologie forestière (trois ans).

COLLÈGE DE ROSEMONT

Techniques d'aménagement du territoire
Ce programme de formation comprend des cours touchant à des domaines tels les études urbaines, l'architecture, la sociologie, la géographie, la géologie, la biophysique et l'infrastructure municipale.

CÉGEP SAINT-JEAN-SUR-RICHELIEU

Gestion et exploitation d'entreprise agricole
Ce programme de cinq sessions comprend des cours touchant à des domaines tels les réalités agricoles du Québec, l'aménagement et le travail du sol, les sols et la fertilisation, la région de la production laitière, la régie de la production animale, la régie des productions céréalières et herbagères, et le droit rural et la fiscalité.

CÉGEP DE SAINT-LAURENT

Assainissement de l'eau
Ce programme a pour but de former des technien(ne)s de l'eau polyvalente aptes à effectuer une variété de tâches reliées à la gérance et à l'opération d'usines de filtration ou d'épuration ainsi que toute autre activité relative à l'eau et à son utilisation. Il comprend les cours suivants : Chimie générale, Introduction à l'assainissement de l'eau, Chimie organique, Physique, Chimie de l'eau I-II, Traitement des eaux usées et boues, et Microbiologie sanitaire.

Assainissement et securité industriels
Les sujets traités incluent la chimie, les éléments d'optique thermodynamique, les contaminants chimiques et physiques, l'analyse des eaux, l'environnement sonore, l'air industriel, les eaux industrielles, la chimie organique, les éléments d'anatomie et de physiologie humaines, et le contrôle des contaminants.

CÉGEP DE STE-FOY

Technologie forestière
Ce programme comprend trois champs de spécialisation : Aménagement forestier, Exploitation forestière et Transformation des produits forestiers. Il traite de sujets tels l'écologie forestière, la silviculture, la dendrologie, la botanie forestière et la géomorphologie forestière.

COLLEGE DE SHERBROOKE

Techniques d'écologie
Ce programme d'une durée de six sessions offre les cours suivants : Anatomie et physiologie des plantes, Biologie cellulaire et microbiologie, Chime et chimie organique, Anatomie et physiologie des animaux, Chimie aquatique, Ornithologie, Entomologie.

DAWSON COLLEGE

Environmental Geography
This course deals with the problems resulting from the interaction between human beings and their physical environment. Processes which affect people such as landslides, earthquakes and volcanoes will be examined. The human impact of human beings on geological environment will also be studied. Topics include acid rain, the greenhouse effect, hazards of nuclear energy, the depletion of the earth's natural resources and waste disposal.

Environmental Options
This program explores cultural, environmental and economic approaches to both urban and rural pollution problems.

INSTITUT DE TECHNOLOGIE AGRO-ALIMENTAIRE DE LA POCATIERE

Agriculture
L'ITA de La Pocatière offre six programmes : Productions animales, Productions végétales, Sols, Gestion agricole, Relève agricole et Techniques équines.

VANIER COLLEGE

Natural Science Technology
This three-year program trains students to become technologists who can work with minimum supervision in Animal Health Technology or Applied Ecology. Course work in these two areas ranges from Invertebrate Zoology, Cell Biology, Chemistry, Immunology, Microbiology, Physical Environment and Biometry to Botany, Vertebrate Zoology, Parasitology, Anatomy and Physiology of Animals, Ecology, Limnology, Entomology, Animal Care, Animal Behaviour, and Biochemistry.

ATLANTIC PROVINCES

WESTVIKING COLLEGE OF APPLIED ARTS, TECHNOLOGY AND CONTINUING EDUCATION

Environmental Technology
Four-semester program designed to train students to identify and evaluate actual or potential environmental hazards, and provide technical support to professional pollution control specialists, engineers, chemists and others. Course work includes Botany, Natural Resources, Chemistry,

Biology, Limnology, Physics, Chemical Analysis, Microbiology, Hydraulics, Environmental Impact Study, Ecology, Environmental Quality Control, and Environmental Law.

Forest Resources Technology
This program aims to train students in the Forest Resources field at a technical level. Course work includes Forest Botany, Forest Biology, Chemistry, Forest Mensuration, Fire Control, Silvic/Dendrology, Silviculture, Forest Soils, Forest Entomology, Forest Utilization and Management, Forest Pathology, Wildlife Management, Resource Administration, and Ecology.

HOLLAND COLLEGE

Aquaculture Technology
This 48-week program train students to meet needs of the aquaculture industry. Course work includes Fish and Shellfish Physiology, Health and Nutrition, Basic Laboratory Analysis, Salmonid Culture Techniques and more.

Environmental Technology
A two-year program designed to introduce students to basic ecological principals, teach them how to collect and analyze samples, and how to interpret their findings. Course work covers Environmental Concerns, Environmental Control, Field Data Collection and Recording, and Occupational Health.

Resources Management
A two-year co-op program which trains students to be fish and wildlife technicians. Course work focuses on Field Work, Law Enforcement, Ecological Concepts, Identification of Resources, and Evaluation and Application of Resource Work.

Urban and Rural Planning Technology
This two-year program develops skills in land planning, environmental and resource management. The course work includes Planing Theory, Planning Tools and Skills, Thematic Maps, Site Planning, Geographic Information Systems and more.

Agriculture
This program trains students for work in the agriculture industry by providing five areas of specialization: General Skills, Animal Production, Crop Production, Mechanization and Construction, and Farm Management. Subjects areas covered include Farm Management, Plant Science, Animal Science, and Agricultural Mechanics.

Aquaculture Technician
This program trains aquaculturalists through courses in Physiology, Environmental Implications of Fish Culture, Health and Epidemiology, Nutrition and Feeding, and Operation and Maintenance of Physical Facilities.

Conservation Enforcement Officer
This program provides skills and knowledge necessary to carry out enforcement programs related to Canada's wildlife, fisheries and habitat. Students will learn how to work within the occupational environment. Topics in this area include Map and Compass Reading, First Aid, Patrol Techniques, Photographic Equipment, and Motorized Equipment.

Environmental Technology - Industrial Chemistry
A program designed to train students in chemical and physical analysis by providing course work in Laboratory Preparation and Maintenance, and Environmental Improvement.

Environmental Technology - Natural Environment
A program designed to train people in the management and protection of the natural environment. Course work includes Management, Classification, Administration, Pollution Control, and Protection.

Landscaping
This program is intended to provide trainees with the knowledge and skills necessary in landscaping gardening. Course work includes Botany, Soils and Composts, Chemical and Organic Fertilizers, Case Studies in Landscape, Plant Protection, Hothouse Cultivation, Landscape Gardening and more.

Silviculture
This program teaches the proper management of forest resources through courses including Introduction to the Forest Industry, Measurement, and Forest Protection.

NOVA SCOTIA AGRICULTURAL COLLEGE

Bachelor of Science in Agriculture
A four-year program that provides the following fields of study: Agricultural Economics, Agricultural Chemistry, Agricultural Mechanization, Agricultural Soils, Animal Science, Plant Protection and Plant Science. Courses range from Botany, Crop Production, Zoology, Organic Chemistry and Physics to Biochemistry, Soil Science, Animal Physiology, Food Chemistry, Animal Nutrition, Plant Physiology, Geology, Ecology, Soil Fertility, Soil and Water, Cell Biology, Genetics, Microbiology, Animal Breeding, Weed Science, Entomology, Mycology, Plant Pathology, and Crop Adaptation.

Agricultural Engineering Diploma
This three-year diploma allows students to proceed to McGill University for the final years of a B.Sc. (Agr.) degree. The program includes Study of Chemistry, Physics, Organic Chemistry, Agricultural Economics, Soil Science, Crop Production, Animal Science, Thermodynamics, Soil and Water, and Fluid Mechanics.

Agricultural Engineering Program
This two-year technician program prepares students for careers on farms or at farm-related firms. Course work includes Soil Science, Soil and Water Management, Field Crops, and Animal Science.

Plant Science
This two-year program trains students for careers as plant specialists or as plant science technicians. Three areas of study are offered: Agronomy, Horticulture and Ornamental Horticulture. Course work covers Entomology, Soil Science, Plant Production Practices, Plant Propagation, Animal Science, Plant Physiology, Weed Science, Soil Management, Agricultural Crops, Nursery Crop Production, Field Crops, Vegetable Production, Plant Pathology, and Farm Management.

Agricultural Engineering Technology
This two-year program is for technician graduates who have completed the first year of a Technician program. Course work ranges from Personnel Management and Agricultural Economics to Crop Production, Animal Science, Soil and Water, and Agricultural Structures.

Farming Technology
A two-year program open to students who have completed the first year of a technician-level program. Course work includes Farm Practices, Soil

Science, Farm Management, Field Crops, Soil Management and a choice of electives including Animal Nutrition, Animal Health, Animal Physiology, Entomology, Plant Production Practices, Plant Propagation, Animal Genetics and Breeding, Plant Pathology, Plant Physiology, and Agricultural Crops, among others.

NSCC - COLLEGE OF GEOGRAPHIC SCIENCES

Environmental and Land Formation Information Systems

Students enrolling in this program are expected to have successfully completed a minimum of two years of post-secondary technical training in a related field such as Agriculture, Forestry, Geology, Surveying, Cartography, Meteorology or Planning. This program is offered as either a 37-week certificate or a 48-week diploma. Students are provided with an excellent basis for dealing with management problems related to ecological and environmental information.

NSCC - INSTITUTE OF TECHNOLOGY

Water Resources Technology Option

The Earth Resources Technology Program, a two-year diploma program, is designed to provide the necessary theoretical concepts and practical skills in the area of Geoscience Technology. In the second year, students may pursue an option in Water Resources Technology. Course work includes Hydrogeology, Groundwater Evaluation, Groundwater Chemistry, and Water Resources Management.

WESTERN COMMUNITY COLLEGE

Forest Ranger

Program includes course work in Dendrology, Identification of Insects and Diseases, Site Preparation Methods, Planting, Forest Management Techniques, Regeneration Surveying, Timber Harvesting and Cultivation, Mensuration, Fire Control, and Forest Roads.

Services, Non-credit Programs or Other Activities Implemented in the Areas of Environment and Sustainable Development

Georgian College

Green Day: One day conference March 1991.

Red River Community College.

Environmental activities include: recycling, staff and student education, surveys of environmental concerns, electronic mail, double-sided copying, use of environmentally friendly products, proper handling of hazardous chemicals, non-smoking policy, ect.

Contact person: Andy Burzynski

Olds College

Environmental Task Force established in September 1991 to develop an Institutional Environmental Policy and co-ordinate college-wide activities dealing with environmental concerns such as recycling, waste management, land management etc. The College has representation on the community environmental Advisory board. The College is also involved in a joint venture feasibility study for the development of waste management technology.

Contact persons: Bill Souster, Dean, Head of Science Center
Ted Sadowski, Director of Finance

Champlain Regional College (Lennoxville Campus)

The students began their own re-cycling program in the residence. Every year Champlain takes part in the design and realization of the Earth Day projects.

Contact persons: Peter Belanger, Director of Residence
Jen Draper, Rep. to Earth Day Committee

Conestoga College

Conestoga College runs a recycling program at all campus locations- "blue boxes" and cardboard recycling.

Contact person: Barry Milner, Manager, Physical Resources

Red Deer College

Red Deer College students and staff collect, sort and recycle bond papers, corrugated cardboard, plastics, newsprint, bottles and jars. Hazardous materials are systematically collected and disposed of in accordance with government regulations.

Contact persons: Mr. Bob Allan
Mr. Don Snow

Centralia College

Internal environmental responsibility, eg. paper recycling, using recycled paper.

Contact persons: Dr. Diane McKelvey
James O'Toole

Medicine Hat College

Activities to date have included general environmental clean-up and the collection of reusable material.

Okanagan College

In co-operation with the Western Canada Wilderness Committee, evening and weekend workshops sponsored by the Continuing Education Divison covering such topics as the South Island Report, Forestry in the Okanagan, and Forests, Wilderness, Wildlife and Transboundry Ecosystems.

Contact person: Laurie Robinson, Program Administrator, Cont. Ed.

SIAST - Palliser CampusMoose Jaw

Annual workshops are held with the municipal advisory council of the City of Moose Jaw on environmental issues.

Together with Environment Canada, Pallisar Campus held a water conservation seminar.

Meeting with the Water Studies Institute

Contact person: Bill Allen, Water Resources, Palliser Campus

Malaspina College

Malaspina College participates in an active paper recycling program which includes all four campuses

Contact person: Jim Baxter, Dean, Science and Technology

Keyano College

Establishment and ongoing activities of the colleges "Green Committee."

Contact person: Committee Chairperson: Mr. D. Nelson, Co-ordinator

Northern Lights College

Established a Reindeer Research Project.

Canadian environmental organizations

NATIONAL ORGANIZATIONS

Canada Center for Inland Waters
867 Lakeshore Road
Burlington, ON L7R 4A6
(416) 336-4999

Canadian Coalition on Acid Rain
112 St. Clair Avenue West, Ste 401
Toronto, ON M4V 2Y3

Canadian Coalition for Nuclear Responsibility
P.O. Box 236 Snowdon
Montreal, PQ H3X 3T4
(514) 489-2665

Canadian Ecology Advocates
15, rue Horatio Walker
Ste. Petronille, PQ G0A 4C0

Canadian Environmental Defense Fund
347 College Street, Ste 301
Toronto, ON M5T 2V8
(416) 323-9521

Canadian Environmental Law Association
517 College Street, Ste 401
Toronto, ON M5V 1Z4
(416) 960-2284

Canadian Environmental Network
P.O. Box 1289
Station B
Ottawa, ON K1P 5R3

Canadian Institute for Environmental Law and Policy
517 College Street
Suite 400
Toronto, ON M6G 4A2

Canadian Wildlife Federation
1673 Carling Avenue
Ottawa, ON K2A 1C4

Centre for Sustainable Regional Development
Dr. Steve Lonergan, Director
University of Victoria
Victoria, B.C.
V8W 2Y2
TEL: 604-721-7339

Ecology Action Centre
Susan Holtz
3115 Veith Street
Halifax, Nova Scotia
B3K 3G9
902-454-7828

Energy Probe Research Foundation
100 College Street
Toronto, Ontario
M5G 1L5
TEL: 416-978-7014

Friends of the Earth
53 Queen Street
Room 16
Ottawa, ON K1P 5C5

Greenpeace Canada
2623 West 4th Avenue
Vancouver, BC V6K 1P8
(604) 736-0321

World Wildlife Fund Canada
60 St. Clair Street East, Ste 201
Toronto, ON M4T 1N5

Environment Canada
Enquiries Centre
Ottawa, ON K1A 0H3
(613) 997-2800

The Environmental Partners Fund - Environment Canada
Canadian Environmental Industry Association
B.C. Chapter
604-261-7000

Canadian Environmental Law Association
243 Queen Street W.
4th Floor
Toronto, Ontario
M5V 1Z4
TEL: 416-977-2410

Canadian Environmental Network
P.O. Box 1289, Stn. B
Ottawa, Ontario
K1P 5R3
TEL: 613-563-2078
FAX: 613-563-7236
WEB: CEN

Environmental Investigations Division
Department of Environment and Lands
4th Floor, West Block
Confederation Building
St. John's, NF.
A1B 4J6
729-6586

Eastern Regional Office
Department of Environment and Lands
Elizabeth Towers
St. John's NF.
A1B 1R9
729-2550

Conservation and Protection
Environment Canada
P.O Box 5037
St. John's, NF.
A1C 5V3
772-5488

Harmony Foundation of Canada
19 Oakvale Avenue
Ottawa, Ontario
K1Y 3S3
613-230-7353

PROVINCIAL ORGANIZATIONS

British Columbia:

British Columbia Environmental Network
2150 Maple Street
Vancouver, BC V6J 3T3
(604) 733-2400

West Coast Environmental Law Association
Room 1001
207 West Hastings Street
Vancouver, BC V6B 1H7
(604) 684-7378

Society Prompting Environmental Conservation
2150 Maple Street
Vancouver, BC V6J 3T3
(604) 736-7732

B.C. Watershed Protection Alliance
Box 9
Slocan Park, B.C. V0G 2G0

Designs curriculum for environmental/sustainable development education.
File.

British Columbia Hydro and Power Authtority
970 Burrard Street
Vancouver B.C.
V6Z 1Y3

Yukon:

Yukon Conservation Society
Room 6
156 Hillcrest Drive
Whitehorse, YT Y1A 4N4

Northern Environmental Network
P.O. Box 4163
Whitehorse, YT Y1A 3T3

Alberta:

Environmental Resource Centre of Alberta
10511 Saskatchewan Drive
Edmonton, AB T6E 4S1

Alberta Environment Network
10511 Saskatchewan Drive
Edmonton, AB T6E 4S1
(403) 433-9302

Environmental Law Centre
202, 10110 - 124 Street
Edmonton, AB T5N 1P6
(403) 482-4891

Prairie Acid Rain Coalition
Box 1288
Rocky Mountain House, AB T0M 1T0
(403) 845-3668

Saskatchewan:

Saskatchewan Environmental Society
Room 205
219 - 22nd Street East
Saskatoon, SK S7K 0G4

Saskatchewan Eco-Network
205 - 219 22nd Street East
Saskatoon, SK S7K 0G4

Manitoba:

Concerned Citizens of Manitoba
592 Walker Avenue
Winnipeg, MB R3L 1C4

Freshwater Institute
501 University Crescent
Winnipeg, MB R3T 2N6
(204) 983-5000

Manitoba Environmentalists, Inc.
Box 3125
Winnipeg, MB R3C 4E6

Manitoba Eco-Network
P.O. Box 3125
Winnipeg, Manitoba R3C 4E6
(204) 956-1468

Manitoba Hydro
P.O. Box 815
Winnipeg, Manitoba
R3C 2P4
TEL: (204) 474-3600
FAX: (204) 474-4114

Ontario:

Ontario Environmental Network
P.O. Box 125, Station P
Toronto, ON M5T 2Z7
(416) 925-1322

Conservation Council of Ontario
489 College Street, Ste 506
Toronto, ON M6G 1A5
(416) 969-9637

Energy Educators
229 College Street
Toronto, ON M5T 1R4
(416) 974-9412

Energy Probe
225 Brunswick Avenue
Toronto, ON M5S 2M6
(416) 978-7014

Friends of the Earth
251 Laurier Avenue West, Ste 701
Ottawa, ON K1P 5J6
(613) 230-3352

Great Lakes Institute
University of Windsor
Windsor, ON N9B 3T4
(519) 253-4232

Greenpeace Toronto
427 Bloor Street West, 2nd Floor
Toronto, ON M6G 1K1
(416) 538-6470

Trees for Today and Tomorrow
44 Eglinton Avenue West, Ste 206
Toronto, ON M4R 1A1

Quebec:

Societé pour vaincre la pollution
P.O. Box 65
Succ. Place d'armes
Montreal, PQ H2Y 3E9

Réseau québécoise des groupes ecologiques
C.P. 1480, Succursale Place D'Armes
Montreal, PQ H2Y 3K8
(514) 982-9444

L'Association québécoise de lutte contre les pluies acides
10763 Berri Street
Montreal, PQ H3L 2H3
(514) 384-9867

Atlantic Center for the Environment
Suite 1900
600 de la Gauchetière Street West
Montreal, PQ H3B 4L8
(514) 843-8297

New Brunswick:

Alternate Energy Association of New Brunswick
P.O. Box 1434
Moncton, NB E1C 8T6
(506) 388-5922

Conservation Council of New Brunswick
180 St. John Street
Fredericton, NB E3B 4A9

NWT:

Northwest Territories
Power Corporation
Bag 6000
Hay river, NWT
X0E 0R0

Prince Edward Island:

Maritime Electric Co., Ltd.
P.O. Box 1328
Charlottetown, PEI
C1A 7N2

Newfoundland:

Western Regional Office
Department of Environment and Lands
Sir Richard Squires Building
Corner Brook, NF.
A2H 6J8
637-2448

Central Regional Office
Department of Environment and Lands
Duffett Building
Clarenville, NF.
A0E 1J0
292-4259

Clarenville Regional Office
Department of Environment and Lands
Duffett Building
Clarenville, NF.
A0E 1J0
466-3278

Labrador Regional Office
Department of Environment and Lands
Goose Bay, Labrador
A0P 1S0
896-5709

Newfoundland Power
55 Kenmount Road
P.O. Box 8910
St. John's, NFLND
TEL: (709) 737-5600
FAX: (709) 737-5882

Nova Scotia:

Ecology Action Centre of Nova Scotia
3115 Veith Street
3rd Floor
Halifax, NS B3K 3G9
(902) 454-7828

Atlantic Environmental Network
3115 Veith Street
Halifax, NS B3K 3G9
(902) 454-2139

Cape Breton Alternate Energy Society
P.O. Box 1463
Sydney, NS B1P 6R7
(902) 562-1404

Nova Scotia Power
P.O.Box 910
Halifax, Nova Scotia
B3J 2W5

INTERNATIONAL ORGANIZATIONS

Environmental Liaison Centre
P.O. Box 72461
Nairobi, Kenya
TEL: 24770\3408496336989
Telex: 23240 envicente

Information Centre for Low External Input and Sustainable Agriculture
P.O Box 64
3830 AB Leuden
the Netherlands

International Institute for Environment and Development
1717 Massachusetts Avenue, N.W.
Washington, D.C.
20036 U.S.A.
TEL: 202-462-0900

International Institute for Sustainable Development
161 Portage Avenue E., 6th Floor
Winnipeg, Manitoba
R3B 0Y4
TEL: 204-958-7700
FAX: 204-95807710

Legacy International
Ira Koffman, Director
Alixandria, Virginia
TEL: 703-549-3630

United Nations Environment Programme
North American Office
Room DC -0803
United Nations
New York, N.Y.
10017 U.S.A.
Tel: 212-963-8093

Centre for Our Common Future
Palais Wilson
52, rue des Paquis
CH-1201 Geneva
Switzerland
TEL: 022-732-7117
FAX: 022-732-5046

The United Nations Association
2 College Street
Suite 116
Toronto, ON M5G 1K3

GREEN *guide*

Rather than presenting promotional statements, The Green Guide gathers case studies of less than perfect human beings coming to grips with the environmental challenges posed by their institutions and training mandates. Much can be learned from the mistakes as well as the success stories.

The Green Guide provides an overview of the steps involved in creating an environmentally sustainable college. It focuses on the principles, strategies and goals which underlie such an endeavour. This volume draws together reports from the ACCC Member Institutions which have undertaken various initiatives to green their campuses.

The Green Guide is useful, not only to academic institutions but to other private sector organizations, as a reference tool for implementing sustainable development. The book is intended to serve as a model and a guide for future action.

NATIONAL ROUND TABLE SERIES ON SUSTAINABLE DEVELOPMENT

1. Sustainable Development: A Manager's Handbook
2. The National Waste Reduction Handbook
3. Decision Making Practices for Sustainable Development
4. Preserving Our World
5. On the Road to Brazil: The Earth Summit
6. Toward Sustainable Communities
7. Trade, Environment and Competiveness

ISBN1-895643-16-3

National Round Table on the Environment and the Economy
Table ronde nationale sur l'environnement et l'économie